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The Calculation of Marginal Effective Corporate Tax Rates in The 1987 White Paper on Tax Reform

by

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Tax Policy and Legislation Branch
Department of Finance, Canada

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Abstract

This paper reports estimates of marginal effective tax rates in Canada for the nonfinancial corporate sector before and after tax reform. These estimates are more disaggregated than the ones contained in the 1987 tax reform papers. Estimates of marginal tax rates by province are reported as well in this paper. An international comparison of marginal effective tax rates between Canada and the U.S. is also presented. This international comparison indicates the impact of tax reform in the two countries on the incentive to invest. Finally, the paper discusses the methodology, assumptions, parameters, and data sources used by the Department of Finance to calculate marginal effective tax rates.

Résumé

Le présent document renferme des estimations des taux marginaux d'impôt en vigueur au Canada avant et après la réforme fiscale, applicables au secteur des entreprises non financières. Ces estimations sont plus fragmentées que celles énoncées dans les documents sur la réforme fiscale publiés en 1987. Le lecteur trouvera aussi des estimations des taux marginaux d'impôt selon la province, ainsi qu'une comparaison des taux marginaux d'impôt en vigueur au Canada et aux États-Unis qui fait ressortir l'incidence de la réforme fiscale sur les stimulants à l'investissement dans ces deux pays. Enfin, il pourra prendre connaissance des méthodes, hypothèses et paramètres utilisés par le ministère des Finances pour calculer les taux marginaux d'impôt, ainsi que des sources de ces données.

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I. INTRODUCTION

In many western economies there is a growing tendency to move away from the use of selective upfront tax incentives in favour of lower statutory tax rates and a broader tax base. Governments in countries such as the United States, the United Kingdom, as well as Canada have embarked on ambitious reforms to their tax systems. The corporate income tax has come under close scrutiny partly because of concerns over the effect of the tax system on the incentive to invest. Recent theoretical and methodological advances in measuring the incentive to invest using marginal effective tax rates have made it possible to sort out the net effect of a large set of complex tax rules and measures.

Estimates of the before and after tax reform impact on the incentive to invest were presented in the White Paper on Tax Reform (1987). The before-tax-reform marginal effective tax rates showed significant variation across different industry groups. Such a situation constitutes a potential source of inefficiency in the allocation of capital in the economy.[1] Under the pre-reform tax system investment may be diverted away from its most productive uses because of tax incentives such as accelerated write-offs and various tax credits. Once the corporate tax reform measures are fully implemented, the results indicate that there will be a sharp reduction in the dispersion of marginal tax rates. Consequently, there will be less potential for the inefficient allocation of resources as compared with the pre-reform system.

The purpose of this paper is to provide some background information on the calculation of the marginal tax rates presented in the White Paper and to provide the results of other simulations that were conducted. It should be noted that the reform marginal tax rates presented here reflect only the relevant White Paper proposals and the provincial corporate income tax systems as of May 1987. The results do not incorporate any further changes made in subsequent federal or provincial budgets. The remainder of the paper is organized as follows. Section II discusses effective tax rates in general and why marginal effective tax rates are useful to measure the incentive to invest. Section III contains more detailed marginal effective tax rates for Canada than those presented in the White Paper as well as the results of calculations made for the provinces and the United States. Section IV outlines the Department of Finance's methodology of marginal tax rate calculations. Finally, Section V describes in more detail the various simulations that were made with the model. An Appendix contains an expanded discussion of input data and sources.

It is important to note that the model does not include every provision in the tax code which could affect the expected tax on the marginal investment. For example, the calculations do not take into account early sale of depreciable assets and the resulting recapture taxes, capital gains taxes, the special treatment of banks and insurance companies, transition rules, and the put-in-use rules.

Our calculations do reflect, however, the most important features of the tax system. The list includes federal and provincial/state taxes that vary by

type of activity and firm size, various capital cost allowance (CCA) rules, first-in, first-out (FIFO) and last-in, first-out (LIFO) accounting rules for inventory, and deductibility of interest payments on corporate debt. Special attention is given to resource extraction industries such as the provisions for intangible exploration and drilling costs, depletion allowances and the interaction of non-deductible Crown royalty and mining tax payments with the resource allowance.

Before we turn to the discussion of marginal tax rates, it is important to mention what motivated these calculations. Marginal tax rates were calculated for the White Paper to analyze the impact of the tax system on the incentive to invest in the private non-financial corporate sector and to study the effect of the corporate income tax reforms on this incentive. This objective has guided us in our choice of assumptions and tax parameters that were used in our calculations. Other investigators asking another set of questions would no doubt use different assumptions and tax parameters than the ones used here. Our calculations deal only with the corporate income tax system. Sales taxes on inputs, property taxes on land and buildings, provincial capital taxes, and royalties on natural resource revenues may also be considered part of the total tax burden on the corporation. If one were interested in the total tax burden on corporations, they should be included along with corporate income taxes. For our purposes, however, we consider only the impact of the corporate income tax system on the incentive to invest.

II. THE INCENTIVE TO INVEST AND MARGINAL EFFECTIVE TAX RATES

To study the incentive effects of the corporate income tax on the level and composition of investment, we need to know the expected tax consequences if a given investment is made. Statutory corporate tax rates are not a good indicator of the incentive to invest for several reasons. First, some assets receive accelerated depreciation write-offs in excess of true economic depreciation. Second, investment tax credits are available that vary by the type of capital expenditure and region of Canada. Third, interest payments on corporate debt are deductible from taxable income while the costs of equity are not generally deductible. As a result, the additional tax liability incurred on a new investment project may be sharply different from the statutory tax rate.

Average tax rates are also not a good measure of the incentive to make an additional investment. Average tax rates, or the ratio of total taxes paid divided by profit, represent the tax on income generated by current and past investments. The calculation of average tax rates includes all business income. It is impossible to identify the income, cost, and tax streams associated with any particular investment project. Under most accounting systems, book income is based upon historical costs which do not provide an accurate measure of the corporation's real profit in times of inflation. As a result of these factors, average tax rates will not reflect the additional tax liability that would be forthcoming from a prospective investment. (For some other reasons why marginal and average tax rates are different, see Fullerton (1984).)

Marginal effective tax rates are needed to study the incentive effects of the tax system. These marginal effective tax rates are a forward-looking measure of the additional tax liability on the last dollar of investment. Economists have used them to sort out the overall effect of existing tax regimes as well as the impact of large and complex tax changes on the incentive to invest. The calculation of marginal tax rates is based on the pioneering work of Hall and Jorgenson (1967) on the cost of capital. Their calculation of the cost of capital includes the overall effects of the statutory corporate income tax rate, investment tax credits, and the degree to which depreciation write-offs are accelerated relative to true economic depreciation. The formula shows what the before-tax rate of return must be over the life of the investment project in order that the corporate income taxes and the required after-tax rate of return are both covered. The marginal effective tax rate is calculated by rearranging these terms and is equal to the difference between the before-tax rate of return and the after-tax rate of return divided by the before tax rate of return (tax-inclusive rate).

Simply stated, a marginal effective tax rate is the extra tax associated with an incremental investment relative to the yield. The present value of expected future taxes relative to the expected income from a marginal investment project are computed.[2] These marginal tax rates are calculated by considering a hypothetical project consisting of an additional dollar invested in a particular asset used in a specific industry. The prospective nature of the investment lends itself to an investigation of the incentive effects in the tax system because the marginal effective tax rate measures the tax consequences if a given investment

is undertaken. The methodology can embody the main features of the corporate tax system. Marginal effective tax rates can therefore summarize the net effect of a complicated tax code in an intuitively appealing way. They have been calculated by Boadway, Bruce, and Mintz (1984), King and Fullerton (1984), and Daly and Jung (1987) among others.[3] Quantitative estimates of marginal effective tax rates are sensitive to various alternative assumptions regarding tax arbitrage, the expected inflation rate, the degree of debt financing and so on. Nevertheless, the pattern of the marginal effective tax rates is similar regardless of the assumptions used.

Marginal tax rates may include corporate taxes only, or corporate plus personal taxes. In this paper, we assume that Canada is a small open economy and capital is perfectly mobile internationally. Therefore, only corporate taxes influence investment decisions while personal taxes affect domestic savings decisions.[4] Taxes at the corporate level include the corporate income tax (Part I tax) as well as certain special transactions taxes (such as the investment income tax) as well as some sales taxes, capital taxes, property taxes, and resource royalties. Because the focus here is on the impact of the corporate income tax system alone, the effect of these other levies are ignored even though they may influence the incentive to invest. The resulting marginal effective tax rates reflect only the impact of the corporate income tax system.

The marginal effective tax rate is the present discounted value of the corporate tax payable divided by the minimum before-tax operating income that an investment would have to generate over its life in order to be just viable.

This income would be just sufficient to provide an after-tax return that covers the cost of capital to the firm. For example, suppose a firm required a 10 per cent after-tax rate of return in order to proceed with an investment project and this implied that the project had to earn a 15 per cent before-tax return. The marginal effective tax rate for the project would simply be the difference between the two rates, divided by the before-tax return. In this example, the marginal effective tax rate would be 33 1/3 per cent. The calculation of the tax paid on a new investment project takes into account both the corporate taxes paid on income earned over the life of the project as well as the value of write-offs and other tax incentives.

III. PRINCIPAL RESULTS

The results of the marginal effective tax rate calculations are presented in Tables 1 to 7. Combined federal/provincial marginal effective corporate income tax rates in Canada are shown in Tables 1 to 3. The marginal tax rates in these tables are by firm size, industry group, and asset. There are large differences in the Pre-Reform[5] marginal tax rates. For example, investment in machinery is taxed lower than buildings which in turn is taxed less than inventories. Agriculture, forestry, and fishing as well as manufacturing face marginal tax rates lower than the average for the non-resource sector. These variations in marginal tax rates are largely explained by the preferential statutory tax rates accorded to manufacturing and small businesses, accelerated depreciation allowances for manufacturing and processing equipment, inventories treated on a cash basis for agriculture and fishing, and FIFO accounting methods on inventories for the remaining sectors.

The Reform marginal tax rates in these tables indicate the impact of the tax reform package on the incentive to invest. Generally speaking, there is less inter-asset and inter-sectoral variation.[6] Investment in machinery and equipment face marginal tax rates more in line with the rate on buildings. This is especially true for the manufacturing sector. There is less dispersion of marginal tax rates across industries. However, investment by large manufacturing firms is still relatively favoured in Canada.

Marginal effective tax rates by province and industry group are shown in Table 4. The main source of variation here is due to the different provincial statutory tax rates and the existence of the Atlantic Canada investment tax credit. The wide variation in tax rates in the resource sector is principally due to different royalty and mining tax provisions between provinces. The overall provincial marginal tax rates also reflect the different composition of industries in each province. Even though the investment tax credit rate in Atlantic Canada falls as a result of tax reform, investment in that region's manufacturing sector still retains a relative advantage in attracting new investment.

Table 5 gives the results of simulations obtained by applying U.S. tax rules before and after U.S. tax reform. In these simulations, Canadian weights and non-tax parameters were used.[7] The Pre-Reform figures indicate a large inter-asset and inter-sectoral variation similar to that experienced for Canada. After tax reform, this variation is reduced significantly. These calculations do not take into account the Alternative Minimum Tax.[8]

A Canada/U.S. comparison of marginal tax rates is shown in Table 6. Excluding the resource sector, the overall marginal tax rates in the two countries are closer together after tax reform as compared with before reform. In the resource sector, the marginal effective tax rates increase in Canada as a result of tax reform but they are still below the U.S. figures. The resource sector marginal tax rates in Canada are also below the overall marginal tax rate both before and after tax reform.

Marginal tax rates for the oil and gas and mining sector by asset type for Canada and the U.S. are presented in Table 7. Overall, the marginal tax rates in Canada for the resource sector increase after tax reform but retain their relative advantage over the U.S. The different marginal tax rates for depletables in Canada on oil and gas and mining are due to the different write-off rates and individual weights on the assets that make up this category. In mining, most of the assets are exploration expenses which receive a 100% write-off. In oil and gas, exploration expenses also receive a 100% write-off but these expenditures constitute only half of the depletables. The remaining expenditures on depletables are for development and oil and gas property expenses which receive substantially lower write-off rates.

The marginal tax rates for Canada are based on the provincial corporate income tax systems as of May 1987. Using the same provincial regimes in both the Pre-Reform and Reform calculations has the advantage that any difference in the results is attributable solely to the federal tax reform measures. Unfortunately, if the current provincial tax systems differ significantly from the ones that existed in May 1987, the Reform marginal tax rates will not be indicative of the incentive to invest that firms actually face. Because of recent changes to some provincial corporate income tax systems, the Reform marginal tax rates are in fact lower than the ones reported in the above tables.

Among other things, the 1988 Ontario and Quebec Budgets effectively increased the CCA write-off rates for provincial tax purposes on equipment used in manufacturing and processing. If these changes are included in the Reform

calculations, the marginal tax rate for manufacturing becomes 28.0 and 19.5 per cent in Ontario and Quebec, respectively. Without the changes, the Reform rates are 29.0 and 20.2 per cent. For Canada as a whole, the faster provincial CCA write-offs have the following effects on the Reform marginal tax rates. The rate on the manufacturing sector falls by nearly one full percentage point, from 26.1 to 25.2 per cent. The overall marginal tax rate for Canada is lower by one-half of a percentage point. Excluding the resource sector, the overall rate is 27.7 per cent instead of 28.2 per cent. If the resource sector is included, the overall Reform rate is 24.3 rather than 24.7 per cent.

TABLE 1

MARGINAL EFFECTIVE FEDERAL/PROVINCIAL CORPORATE TAX RATES
FOR SMALL CORPORATIONS IN CANADA BY INDUSTRY GROUP AND TYPE OF CAPITAL
(%)

PRE-REFORM

	Structures	Machinery	Land	Inventory	Total
Agriculture, Forestry, Fishing	9.2	8.5	11.2	-11.3	8.8
Manufacturing	6.7	2.7	8.0	14.6	8.3
Construction	11.2	9.1	11.1	19.7	14.5
Transportation	10.2	13.6	11.3	19.9	11.4
Communication	10.6	13.6	11.3	19.9	11.8
Public Utilities	10.3	16.0	11.2	19.9	11.7
Wholesale Trade	9.1	13.4	10.9	19.4	15.0
Retail Trade	8.9	16.0	11.1	19.6	14.9
Services	9.5	14.9	10.8	19.3	12.4
Total (Excluding Resource)	9.0	10.6	10.8	17.2	12.1

REFORM

Agriculture, Forestry, Fishing	9.1	7.7	10.6	-10.8	8.4
Manufacturing	9.5	7.7	9.8	17.5	11.7
Construction	11.2	9.8	10.6	18.9	14.3
Transportation	10.3	12.1	10.6	18.9	11.0
Communication	10.7	13.2	10.6	18.9	11.7
Public Utilities	10.9	14.2	10.6	18.9	11.8
Wholesale Trade	9.5	13.2	10.6	18.9	14.8
Retail Trade	9.1	14.5	10.6	18.9	14.4
Services	10.0	13.9	10.6	18.9	12.1
Total (Excluding Resource)	9.7	11.1	10.6	17.4	12.4

TABLE 2

MARGINAL EFFECTIVE FEDERAL/PROVINCIAL CORPORATE TAX RATES
FOR LARGE CORPORATIONS IN CANADA BY INDUSTRY GROUP AND TYPE OF CAPITAL
(%)

PRE-REFORM

	Structures	Machinery	Land	Inventory	Total
Agriculture, Forestry, Fishing	28.4	25.6	29.2	-29.8	25.0
Manufacturing	25.2	14.5	24.7	39.5	26.2
Construction	31.2	25.3	30.0	45.6	36.7
Transportation	29.4	33.3	30.1	45.5	31.3
Communication	32.2	35.4	29.9	45.6	33.5
Public Utilities	29.3	36.1	30.2	45.9	31.4
Wholesale Trade	28.2	29.4	29.6	45.2	37.8
Retail Trade	24.0	38.4	30.0	45.6	37.1
Services	27.1	37.9	28.9	44.6	33.0
Total (Excluding Resource)	28.0	23.1	27.9	41.8	30.2

REFORM

Agriculture, Forestry, Fishing	25.3	21.8	25.4	-25.9	21.5
Manufacturing	23.8	20.0	22.0	35.9	26.1
Construction	28.1	25.1	25.9	40.7	33.2
Transportation	26.6	28.4	26.0	40.6	27.8
Communication	29.6	30.6	25.9	40.7	30.0
Public Utilities	28.5	30.6	26.1	40.9	29.4
Wholesale Trade	25.7	28.3	25.7	40.4	33.8
Retail Trade	21.4	33.1	25.9	40.7	32.7
Services	24.8	32.4	25.2	40.0	29.0
Total (Excluding Resource)	25.9	23.9	24.4	37.6	28.2

TABLE 3

MARGINAL EFFECTIVE FEDERAL/PROVINCIAL CORPORATE TAX RATES
FOR LARGE AND SMALL CORPORATIONS IN CANADA
BY INDUSTRY GROUP AND TYPE OF CAPITAL
(%)

PRE-REFORM

	Structures	Machinery	Land	Inventory	Total
Agriculture, Forestry, Fishing	11.7	11.9	13.2	-13.2	10.9
Manufacturing	23.4	13.5	21.7	36.9	24.4
Construction	19.9	16.0	19.3	31.9	24.4
Transportation	27.3	31.1	28.1	43.8	29.2
Communication	31.9	35.1	29.7	45.3	33.2
Public Utilities	29.1	35.9	30.0	45.6	31.2
Wholesale Trade	21.7	23.9	23.3	37.3	30.4
Retail Trade	16.4	27.9	20.8	33.9	26.6
Services	17.4	25.8	18.9	32.2	22.0
Total (Excluding Resource)	24.5	20.7	19.6	35.8	26.0

REFORM

Agriculture, Forestry, Fishing	11.2	10.4	12.3	-12.4	10.0
Manufacturing	22.4	18.9	19.7	33.8	24.6
Construction	18.4	16.2	17.1	28.7	22.5
Transportation	24.8	26.5	24.3	39.1	25.9
Communication	29.3	30.4	25.7	40.4	29.7
Public Utilities	28.3	30.4	25.9	40.6	29.2
Wholesale Trade	20.0	23.0	20.4	33.5	27.4
Retail Trade	15.1	24.1	18.3	30.5	23.8
Services	16.5	22.4	16.9	29.3	19.7
Total (Excluding Resource)	22.8	21.5	17.5	32.5	24.4

TABLE 4

MARGINAL EFFECTIVE FEDERAL/PROVINCIAL INCOME TAX RATES FOR LARGE CORPORATIONS BY PROVINCE AND INDUSTRY GROUP
(%)

PRE-REFORM

	B.C.	Alta	Sask.	Man.	Ont.	Que.	N.B.	N.S.	P.E.I.	Nfld.
A,F&F	25.5	26.9	28.6	28.6	27.1	19.1	18.9	17.1	21.5	15.4
Manufac	29.5	23.6	31.1	30.3	29.3	20.3	20.2	20.2	20.2	21.3
Constr	38.4	38.4	40.3	40.3	38.9	29.5	34.8	34.8	34.8	35.9
Tr&Sto	32.9	32.9	34.8	34.8	33.4	24.8	29.8	29.8	29.8	30.8
Comm	34.8	34.8	36.7	36.7	35.3	26.4	34.8	34.8	34.8	35.7
PubUtil	32.8	32.8	34.7	34.7	33.3	24.7	31.4	31.4	31.4	32.4
WsTrade	39.3	39.3	41.3	41.3	39.8	30.4	37.8	37.8	37.8	38.8
RtTrade	38.5	38.5	40.5	40.5	39.0	29.7	38.4	38.4	38.4	39.3
Service	34.4	34.4	36.3	36.3	34.9	26.0	32.6	32.6	32.6	33.6
Mining	-18.5	-17.7	9.5	-28.8	-8.1	-18.7	-44.2	-	-	-47.7
Oil&Gas	26.1	9.2	26.8	-	-	-	-	-	-	-
Total	26.9	14.7	28.3	30.2	30.4	21.7	19.0	29.2	30.4	17.8

REFORM

	B.C.	Alta	Sask.	Man.	Ont.	Que.	N.B.	N.S.	P.E.I.	Nfld.
A,F&F	21.8	23.3	24.9	24.9	23.5	16.1	16.7	15.2	18.9	13.9
Manufac	29.2	23.5	30.9	30.3	29.0	20.2	22.3	22.3	22.3	23.3
Constr	34.8	34.8	36.7	36.7	35.3	26.2	31.8	31.8	31.8	32.8
Tr&Sto	29.3	29.3	31.1	31.1	29.8	21.5	26.9	26.9	26.9	27.8
Comm	31.3	31.3	33.1	33.1	31.7	23.2	31.2	31.2	31.2	32.1
PubUtil	30.8	30.8	32.5	32.5	31.2	22.8	29.7	29.7	29.7	30.6
WsTrade	35.3	35.3	37.2	37.2	35.8	26.6	34.0	34.0	34.0	35.0
RtTrade	34.0	34.0	35.9	35.9	34.5	25.5	33.9	33.9	33.9	34.8
Service	30.3	30.3	32.1	32.1	30.7	22.3	28.8	28.8	28.8	29.7
Mining	9.3	7.9	28.5	3.5	8.4	2.1	-4.3	-	-	-6.2
Oil&Gas	23.2	14.0	23.9	-	-	-	-	-	-	-
Total	27.2	18.2	29.8	29.5	29.2	20.7	21.6	27.5	28.2	21.0

TABLE 5

MARGINAL EFFECTIVE CORPORATE TAX RATES
FOR LARGE CORPORATIONS USING U.S. TAX RULES AND
CANADIAN NON-TAX PARAMETERS BY INDUSTRY GROUP AND TYPE OF CAPITAL
(%)

PRE-REFORM

	Structures	Machinery	Land	Inventory	Total
Agriculture, Forestry, Fishing	11.9	7.3	33.0	10.4	22.8
Manufacturing	26.9	9.4	33.0	42.7	27.0
Construction	27.4	10.0	33.0	48.7	35.2
Transportation	10.4	13.9	33.0	48.1	15.5
Communication	23.9	11.6	33.0	49.0	19.8
Public Utilities	8.4	15.8	33.0	48.1	12.4
Wholesale Trade	25.5	12.6	33.0	46.5	37.4
Retail Trade	21.8	15.7	33.0	45.0	34.8
Services	24.5	18.0	33.0	48.5	25.8
Total (Excluding Resource)	20.7	11.0	33.0	44.2	26.0

REFORM

Agriculture, Forestry, Fishing	22.6	16.4	23.8	4.7	20.3
Manufacturing	26.3	21.6	23.8	32.1	26.2
Construction	26.6	21.0	23.8	37.6	30.0
Transportation	20.3	22.1	23.8	37.0	21.9
Communication	27.2	20.9	23.8	37.8	24.8
Public Utilities	20.5	25.3	23.8	37.0	22.2
Wholesale Trade	24.6	23.0	23.8	35.6	30.1
Retail Trade	19.7	24.2	23.8	34.2	27.6
Services	23.4	26.5	23.8	37.4	25.6
Total (Excluding Resource)	23.9	22.0	23.8	33.4	25.7

TABLE 6

CANADA/U.S. COMPARISON OF MARGINAL EFFECTIVE CORPORATE INCOME TAX RATES USING EACH COUNTRY'S TAX RULES AND CANADIAN NON-TAX PARAMETERS

(Large Corporations)
(%)

	PRE-REFORM		REFORM	
	Canada	U.S.	Canada	U.S.
Agriculture, Forestry, Fishing	25.0	22.8	21.5	20.3
Manufacturing	26.2	27.0	26.1	26.1
Construction	36.7	35.2	33.2	30.0
Transportation	31.3	15.5	27.8	21.9
Communication	33.5	19.8	30.0	24.8
Public Utilities	31.4	12.4	29.4	22.2
Wholesale Trade	37.8	37.4	33.8	30.1
Retail Trade	37.1	34.8	32.7	27.6
Services	33.0	25.8	29.0	25.6
Total (Excluding Resource)	30.2	26.0	28.2	25.7
Resource Sectors				
- oil & gas	11.1	18.5	14.9	19.3
- mining	-15.1	22.9	8.7	23.8
TOTAL	24.6	24.6	24.7	24.6

(N/A: not available)

TABLE 7

CANADA/U.S. COMPARISON OF MARGINAL EFFECTIVE CORPORATE TAX RATES
FOR RESOURCE SECTOR BY TYPE OF CAPITAL
USING EACH COUNTRY'S TAX RULES AND CANADIAN NON-TAX PARAMETERS

(Large Corporations)
(%)

	Structures	Equipment	Depletables	Land	Inventory	Total
CANADA						
Pre-Reform						
Oil & Gas	17.4	14.7	6.5	31.4	35.7	11.1
Mining	-6.4	-5.3	-174.6	23.1	41.9	-15.1
Reform						
Oil & Gas	24.2	23.4	8.6	27.3	32.2	14.9
Mining	14.3	13.9	-33.3	20.3	38.0	8.7
U.S.						
Pre-Reform						
Oil & Gas	37.6	-3.2	18.2	33.5	44.7	18.5
Mining	39.5	-0.7	24.4	33.5	44.7	22.9
Reform						
Oil & Gas	34.9	16.1	16.5	23.9	33.6	19.3
Mining	36.6	15.7	20.0	23.9	33.6	23.8

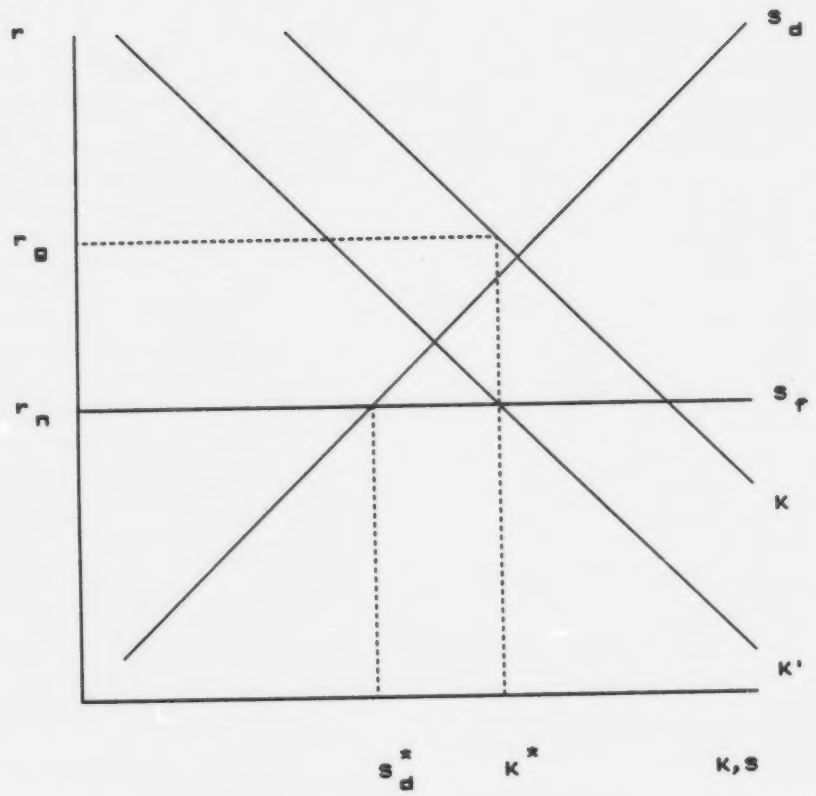
IV. THEORETICAL MODEL

A. Non-Resource Sector

Our methodology of marginal effective tax rates closely follows that of Boadway, Bruce, and Mintz (1984). The concept of marginal tax rates may be illustrated using Figure 1. The demand for capital schedule, K, shows the relationship between the gross of tax rate of return, r, and the amount of capital that firms use. Net of corporate income taxes, the demand for capital schedule is shown as K'. There are two supply of savings schedules shown here. S_d is the domestic supply of savings schedule relating the amount of Canadian savings that would be forthcoming at any interest rate r. The other schedule, S_f, relates the amount of foreign savings to the rate of return. This latter supply of savings schedule is perfectly elastic which reflects the assumption that Canada is a small open economy and that the rate of return that must be paid to foreign investors is exogenously determined. Given the system of taxation, the equilibrium level of capital and savings is K*, the gross of tax rate of return is r_g, and the net of tax rate of return is r_n. Canadian savers supply S_d^* and foreign investors supply the balance.

Marginal effective tax rates, t, are calculated by directly computing the tax wedge, or the difference between the before-tax real rate of return net of depreciation required on the marginal project, r_g, and the real rate of return after corporate taxes required by the saver, r_n. Dividing the tax wedge by the pre-tax rate of return yields the marginal effective tax rate:

FIGURE 1



$$(1)\quad t = (r_g - r_n)/r_g$$

The real rate of return after corporate tax, r_n, is the weighted average of the return from corporate debt and equity:

$$(2)\quad r_n = Bi + (1 - B)\rho - \pi$$

where

B is the proportion of debt financing

i is the nominal interest rate on corporate debt

ρ is the nominal rate of return on corporate equity

π is the expected inflation rate

Note that the weighted return from debt and equity is calculated first in nominal terms before the inflation rate is subtracted. It is assumed that the after corporate tax rate of return, r_n, is determined on international financial markets.[9] Moreover, this rate of return is the same for all types of capital with the exception of resource related assets as discussed later on. The after tax rate of return is easily calculated using readily available data.

The gross of tax rate of return, r_g, cannot be measured directly. To do so would require that the marginal investment project be identified and its rate

of return measured. Fortunately, however, the before tax rate of return on the marginal investment project can be measured indirectly. According to the neo-classical theory of the firm, a profit maximizing firm will invest until at the margin, the expected rate of return on capital is equal to the user cost of capital, net of depreciation and gross of risk. In other words, a marginal investment will be undertaken if the present discounted value of cash flows equals the initial outlay.

Suppose a marginal investment has an acquisition cost of q. An investment tax credit at a rate ϕ reduces the initial outlay to $(1 - \phi)q$. This investment will generate a cash inflow, c, which is expressed as a function of time, t. The total cash inflow is made up of the rental price of the asset (c) and the tax savings from CCA write-offs. The rental price is the price that the asset could be rented for if the owner covers taxes, depreciation, and maintenance. It is assumed that this return grows with the rate of inflation π and declines as the asset depreciates at the economic rate of depreciation δ. If the combined federal and provincial corporate income tax rate is u, then at time t, the after tax rental receipts from the investment equals $(1 - u)ce^{(\pi - \delta)t}$. To compute the present value of this income stream, the returns are discounted using the nominal after tax cost of finance to the firm r_f:

$$(3)\quad r_f = Bi(1 - u) + (1 - B)\rho$$

Depreciation allowances constitute part of the cash inflows since they reduce corporate income taxes. If CCA write-offs occur at a rate α on an exponential basis, the tax reduction at any time t equals $u(1 - \phi)q\alpha e^{-\alpha t}$. The basis for depreciation allowances is reduced by any investment tax credits received. Therefore $(1 - \phi)q$ is eligible for capital cost allowances.

In equilibrium, the nominal cash inflows must equal the initial outlay:

$$(4)\ (1 - \phi)q = \int_0^\infty (1 - u)\, ce^{(\pi - \delta)t} e^{-r_f t}\, dt$$

$$+ \int_0^\infty u\,(1 - \phi)\, q\, \alpha\, e^{-\alpha t}\ e^{-r_f t}\, dt$$

In the above equation, the left hand side is the initial cash outlay. The first term on the right hand side is the present value of rental receipts while the second term is the present value of CCA write-offs.

Equation (4) can be integrated and solved for the gross of depreciation rental rate, c/q:

$$(5)\ c/q = (r_f - \pi + \delta)\,(1 - \phi)\,(1 - uZ)/(1 - u)$$

In equation (5), Z is the present value of CCA allowances per dollar of investment. Z will be affected by the lifetime of the asset for tax purposes and the depreciation method (i.e. declining balance or straight line).

Because the rental rate is gross of depreciation, we subtract the economic depreciation rate δ to obtain the real before tax rate of return net of depreciation and gross of risk:

$$(6)\quad r_g = c/q - \delta = (r_f - \pi + \delta)(1 - \phi)(1 - uZ)/(1 - u) - \delta$$

The above expression is the well known Hall-Jorgenson user cost of capital. This rate of return is the minimum return that the investment project can yield and still be viable in the sense that it covers both the additional corporate income taxes that will be due and the required return to the saver providing the funds. Equation (6) is used to calculate the before tax rate of return. It will vary among the different types of capital because of differences in the tax treatment and economic depreciation rates.

The present value of CCA deductions, Z, on $1 of capital is determined as follows. If CCA write-offs are allowed on a declining balance basis and occur at a rate α,

$$Z = \int_0^\infty \alpha\, e^{-\alpha t}\, e^{-r_f t}\, dt$$

$$= \alpha/(\alpha + r_f)$$

At each point in time, the firm writes off $\alpha e^{-\alpha t}$ of the purchase price of capital, net of investment tax credits. Because depreciation allowances are in nominal values, this write-off is discounted by the nominal interest rate r_f.

The half year convention applies to most CCA classes. In the year of acquisition, the claim for CCA is limited to one-half the allowable rate. In the first year, the firm may claim $\alpha/2$ on each dollar of new investment. The CCA base in the following year is equal to $(1 - \alpha/2)$ which is written off at a declining balance rate α. The present value of CCA deductions becomes

$$Z = (\alpha/2) + (1 - \alpha/2)\int_1^{\infty} \alpha e^{-\alpha(t-1)} e^{-r_f t}\, dt$$

$$= (\alpha/(\alpha + r_f))\, e^{-r_f} + (\alpha/2)\,[1 - (\alpha/(\alpha + r_f))\, e^{-r_f}]$$

Some other CCA classes receive a 50% write-off on a straight line basis with a half year convention. The present value of these CCA write-offs[10] is equal to

$$Z = .25/(1 + r_f) + .5/(1 + r_f)^2 + .25/(1 + r_f)^3$$

For investment in inventory, equation (6) must be amended to reflect FIFO accounting techniques. The cost of inventory for tax purposes is based on the historic price of the oldest item in stock. During inflationary periods, this is less than the replacement cost of the item which means that there are inflationary profits subject to tax. If the holding period of inventories is less than one year and the real price of inventories does not change over time, the real before tax rate of return of inventory capital is

$$(7)\quad r_g = c/q = (r_f - \pi + u\pi)/(1 - u)$$

The term $u\pi$ is the increase in the user cost arising from the tax on the inflationary component of inventories. Investment tax credits and CCA write-offs are not available for investment in inventories. The inventory allowance, a special deduction of 3 per cent of the cost of a corporation's opening inventory, was abolished in 1986.

In agriculture and fishing, inventories are treated on a cash basis and are expensed when acquired. The expensing of inventories eliminates any tax at the margin on inventories because the government reduces both the return and the cost of inventories by the same proportion. In addition, the deductibility of interest payments incurred for financing subsidizes the holding of inventories. (This point is reflected in the definition of r_f in Equation (3)).

$$(8)\quad r_g = c/q = (r_f - \pi)$$

The expression for the pre-tax real rate of return for land reflects the fact that this asset is not subject to depreciation and does not qualify for investment tax credits or CCA write-offs. The before tax real rate of return is therefore:

$$(9)\quad r_g = c/q = (r_f - \pi)/(1 - u)$$

B. Resource Sector

The above expressions for the cost of capital must be modified for the resource sector. Special treatment is required here because of three factors which apply only to industries in mining and oil and gas. First, there are special aspects of the Income Tax Act regarding the resource sector. For example, at the federal level a resource allowance is granted in lieu of the non-deductibility of royalties and mining taxes. Second, a large proportion of capital expenditures in the resource sector involves intangible capital such as exploration (CEE) and development (CDE). Special user cost of capital expressions must be developed for these assets. Third, production in the resource sector is limited by the supply of reserves available for extraction.

In the resource sector, the incentive to invest is influenced by both corporate income taxes and royalties/mining taxes. Our interest in this paper is on the effect of the corporate income tax alone on the incentive to invest. As a result, we need to isolate the impact of income taxes from the effect of royalties/mining taxes on our calculations. In order to calculate the tax wedge created by the corporate income tax system, the marginal tax rates contained in the White Paper have been computed assuming royalties/mining taxes are a cost of production. The alternative assumption, treating these provincial levies as a tax, has little effect on the results.

Our calculations are complicated by the resource allowance and royalties/mining taxes interaction. A 25 per cent resource allowance is provided

to firms in lieu of royalty deductibility for federal income tax purposes. In general, the resource allowance and royalties/mining taxes do not perfectly offset each other. As a result, there is an interaction between these levies and the resource allowance. For example, all mining assets and certain oil and gas sector assets currently benefit from an additional subsidy because the resource allowance deduction is greater than the royalties/mining taxes paid on income generated by these assets. Royalties/mining taxes in the resource sector can be small due to royalty holidays, low royalty rates or because of the deductibility of costs. If these levies were to fall, the subsidy provided through the resource allowance deduction would increase thereby lowering the federal marginal effective corporate tax rate. Because royalties/mining taxes are effectively deductible in most cases for provincial corporate income tax purposes, this interaction effect does not occur with provincial corporate income systems. Our calculations of marginal effective tax rates in the resource sector captures this interaction between royalties/mining taxes and the resource allowance.

Because of royalties/mining taxes, the equation for the cost of capital in the resource sector is more complicated than the one for non-resources. If these levies were simply ignored, our gross of tax rate of return would reflect corporate income taxes but not the effects of royalties/mining taxes. This approach, however, would not capture the interaction between royalties/mining taxes and the resource allowance. On the other hand, if these levies were included, this interaction would be reflected but the gross of tax rate of return would comprise both the effects of corporate income taxes and royalties/mining taxes on the cost of capital. The method that was used to derive the cost of

capital in the resource sector that is gross of income taxes but net of royalties/mining taxes and at the same time, includes the interaction effect can be summarized by the following. We first derive the rental rate that is gross of both corporate income taxes and royalties/mining taxes. We then net out the tax burden from royalties/mining taxes. The result is a rental rate that is gross of income taxes, net of royalties/mining taxes but includes the interaction between royalties/mining taxes and the resource allowance. If royalties/mining taxes were deductible for federal tax purposes, we know that the formula for the gross of income tax, net of royalties/mining tax cost of capital should be similar to the one that applies to the non-resource sector. This information is used to net out the effects of royalties/mining taxes but leave the interaction effect in the cost of capital.

Effective marginal royalty rates were calculated for conventional oil and gas projects in the Western Basin, enhanced oil recovery projects, and the Syncrude and Suncor tar sands in Alberta. Where applicable, the marginal royalty rates were adjusted to reflect the present value of benefits from royalty holidays. In cases such as conventional oil and gas projects where royalties are calculated at the wellhead or field gate without a deduction for extraction costs, the marginal royalty rate was expressed as an effective rate on the marginal revenues net of the marginal extraction costs. This adjustment simplified the formulas without changing any of the results. (See Department of Finance (1985b) for formulas without this adjustment). The effective marginal royalty rate g' was computed as

$$(10)\quad g' = g\,P/(P - C')$$

where

g is the marginal royalty rate

P is the wellhead or field gate price

C' is the marginal extraction cost

A similar adjustment was not necessary for the other royalties because extraction costs are deductible.

The cost of capital formulas for the resource sector also vary depending on the type of project. The reason for this is because different fiscal regimes apply to the various projects. For example, the analysis below applies to conventional oil and gas projects in British Columbia, Alberta, and Saskatchewan. In the case of some tar sands projects, the cost of capital expression had to be modified to reflect the assumption that they do not claim the optional Alberta Royalty Tax Rebate owing to the low royalty rate they face. Conventional mining projects are dealt with later in this section. Because of some similarities in their fiscal treatment, the cost of capital equations for certain nonconventional oil and gas projects such as Syncrude, enhanced oil recovery, and in-situ developments are derived by modifying the expression for conventional mining. For example, the formula for enhanced oil recovery with cost sensitive royalties results in a user cost of capital expression similar to the one derived for a conventional mining project.

The rental income net of income taxes and royalties for a conventional oil and gas project can be expressed as follows

$$(11)\ c\,(1 - g' - u_f\,(1 - \psi) - u_p\,(1 - g'))$$

where

- c is the rental income gross of corporate income taxes and royalties
- u_f is the statutory federal corporate tax rate
- u_p is the statutory provincial tax rate
- ψ is the resource allowance rate of 25 per cent
- g' is the effective marginal royalty rate expressed in terms of revenues net of extraction costs

The rental income is reduced by the effective royalty rate, g', and by the federal and provincial income taxes. The effective statutory federal income tax rate is the statutory federal rate net of the resource allowance, $u_f(1 - \psi)$. The effective statutory provincial rate reflects royalty deductibility instead of the 25 per cent resource allowance, $u_p\,(1 - g')$.

The equilibrium condition for a tangible asset in an oil or gas project is

$$(12)\ c\,(1 - g' - u_f(1 - \psi) - u_p(1 - g')) =$$

$$q(r_f - \pi + \delta)\,(1 - \phi)\,(1 - u_f(1 - \psi)Z - u_pZ)$$

This expression can be solved for the rental rate c/q:

$$(13)\quad c/q = \frac{(r_f - \pi + \delta)(1 - \phi)(1 - u_f(1 - \psi)Z - u_p Z)}{(1 - g' - u_f(1 - \psi) - u_p(1 - g'))}$$

A resource allowance reduces the federal income tax rate to $u_f (1 - \psi)$. Provincial royalties, g', adds another layer of taxes to the income stream. The effective purchase price is reduced by an investment tax credit at a rate ϕ. A further reduction in the purchase price arises from CCA deductions: $(1 - u_f(1 - \psi) Z - u_p Z)$. The tax savings for CCA at the federal level are reduced by $(1 - \psi)$ because CCA claims are deductible from the resource allowance base. Equation (12) also reflects the fact that royalties are deductible for provincial income tax purposes and that the investment tax credit reduces the base for CCA purposes.

In order to isolate the impact of the corporate income tax from the royalty, the expression in (13) for the rental rate net of taxes and royalties is multiplied by $(1 - g')/(1 - g')$. The equilibrium condition with royalties treated as a cost of production is therefore

$$(14)\ (c/q)(1-g') =$$

$$\frac{(r_f - \pi + \delta)(1-\phi)(1-u_f(1-\psi)Z - u_pZ)(1-g')}{(1-g'-u_f(1-\psi)-u_p(1-g'))}$$

and the real rate of return net of depreciation and gross of risk is

$$(15)\ r_g = (c/q)(1-g') - \delta$$

$$= \frac{(r_f - \pi + \delta)(1-\phi)(1-u_f(1-\psi)Z - u_pZ)(1-g')}{(1-g'-u_f(1-\psi)-u_p(1-g'))} - \delta$$

The above equation is the rate of return gross of tax and net of royalties.

To check the validity of equation (15), note that if royalties had been deductible for federal income tax purposes, the effective statutory federal tax rate on rental income would be $u_f(1 - g')$ and the value of CCA deductions would be $(1 - \phi)u_fZ$ rather than $(1 - \phi)u_f(1 - \psi)Z$. Therefore equation (14) could be rewritten as

$$(16)\ (c/q)(1-g') =$$

$$= \frac{(r_f - \pi + \delta)(1-\phi)(1-u_fZ - u_pZ)(1-g')}{(1-g'-u_f(1-g')-u_p(1-g'))}$$

$$= \frac{(r_f - \pi + \delta)(1 - \phi)(1 - u_f Z - u_p Z)(1 - g')}{(1 - u_f - u_p)(1 - g')}$$

It should be apparent that equation (16) reduces to the rental rate formula for non-resource assets

$$(17)\ (c/q)(1 - g') = \frac{(r_f - \pi + \delta)(1 - \phi)(1 - u_f Z - u_p Z)}{(1 - u_f - u_p)}$$

The formulas for a tangible asset in the mining sector, enhanced oil recovery projects, and the Syncrude project are more complicated by the fact that capital costs are deductible for mining tax purposes. For example, the rental income net of income taxes and mining taxes for a mining asset is

$$(18)\ c\,(1 - u_m - u_f(1 - \psi) - u_p(1 - \psi))$$

where u_m is the marginal mining tax rate. The rental income of a mining asset is similar to an asset of an oil and gas project except that the 25 per cent resource allowance is deductible for provincial corporate income taxes as well.

The equilibrium condition for a tangible asset in a mining project is

$$(19)\ c\,(1 - u_m - u_c) = q\,(r - \pi + \delta)\,[(1 - \phi)(1 - u_c Z) - u_m Z_m]$$

where $u_c = u_f (1 - \psi) + u_p (1 - \psi)$ and Z_m is the present value of the depreciation allowances for provincial mining tax purposes.[11]

Although the provincial mining tax adds another layer of taxes on the marginal revenue stream, it also gives rise to additional tax savings by way of a depreciation allowance, $u_m Z_m$. The investment tax credit also lowers the effective purchase price of a unit of capital by $(1 - \phi)$. While the CCA base is reduced by the investment tax credit for federal and provincial income tax purposes, no such reduction is required for the depreciation allowance for mining tax purposes.[12] Certain assets in the mining sector (Class 28 and processing assets)[13] are eligible for earned depletion. This tax incentive allows corporations to claim an additional deduction of one-third of a dollar for each dollar spent on eligible assets. The earned depletion allowance may be incorporated into the above equation by subtracting $(u_f + u_p)D$ from the effective purchase price of the unit of capital, where D is the earned depletion rate.

To isolate the impact of the corporate income tax from the mining tax, equation (19) for the rental income net of income taxes and royalties is multiplied by $M(1 - u_m)/M(1 - u_m)$ where M is defined below. This expression is slightly more complicated than the one used for an oil and gas asset because of the deductibility of capital costs for mining tax purposes. In order to determine what M should be, we know that if mining taxes were deductible for federal corporate income tax purposes and there was no resource allowance,

$(c/q)(1 - u_m)M$ should be independent of the level of mining taxes.

The equilibrium condition with mining taxes deductible is

$$(20)\quad c/q = \frac{(r_f - \pi + \delta)(1 - \phi)(1 - u_c Z) - u_m Z_m (1 - u_c)}{(1 - u_c)(1 - u_m)}$$

The interaction term, $u_m Z_m u_c$, shows that since mining taxes are deductible, the tax shield from the corporate tax system is reduced by the value of the depreciation deduction for mining tax purposes.

If equation (20) is multiplied by $(1 - u_m)$ M, where M is defined below, the rental rate will be similar to the one that applies to the non resource sector.[14] The expression for M is as follows:

$$(21)\quad M = 1/[1 - (u_m Z_m (1 - u_c)/(1 - \phi)(1 - u_c Z))]$$

Therefore the rental rate for an asset in the mining sector which isolates the impact of the corporate income tax from the mining tax is as follows:

$$(22)\quad (c/q)(1 - u_m)M = \frac{(r_f - \pi + \delta)[(1 - \phi)(1 - u_c Z) - u_m Z_m](1 - u_m)M}{(1 - u_c - u_m)}$$

Subtracting the economic rate of depreciation from both sides of Equation (22) yields the real rate of return net of depreciation and gross of risk.

Exploration and development expenditures are treated in the following manner. Similar to depreciable capital, the user cost of exploration and development capital consists of financing costs, the loss in the value of the capital over time due to economic depreciation, and the tax savings resulting from available write-offs. Exploration and development activity is undertaken to obtain information and knowledge about the location and extent of reserves. The expenditures may be viewed as giving rise to a stock of intangible capital which will then be used in the production process in future time periods. A point input, flow output process is envisaged, where expenditures incurred in the current period create a stock of capital which gives rise to a flow of output in the future. Resource companies operate under a reserve constraint available for extraction. The intangible stock of capital created by exploration and development is combined with tangible depreciable capital to give rise to a flow of depletable assets available for extraction.

As the reserves are depleted, the value of the stock of capital created by exploration and development falls because the information declines in value. These expenditures may therefore be thought of as creating a stock of intangible capital which loses its value over time, not because of physical wear and tear since the capital is intangible and thus does not depreciate in the usual sense, but rather due to capital revaluation of the information's worth. The economic depreciation term (ε) in the user cost of capital expression for exploration and development incorporates this notion of capital revaluation.

The tax adjusted user cost of intangible capital for the mining industry may be written as follows:

$$(23)\ (c/q)\ (1 - u_m)M = \frac{(r_f - \pi + \varepsilon)(1 - u(Z_e + D) - u_m Z_m)\ (1 - u_m)\ M}{(1 - u(1 - \psi) - u_m)}$$

where Z_e is the present value of the exploration and development write-offs, D is the earned depletion rate, and ε is the economic rate of depreciation. Note that the effective purchase price of a unit of exploration and development capital in equation (23) is decreased by $u(Z_e + D)$. This reflects the fact that exploration and development expenditures are deductible immediately in the mining sector and that they qualify for earned depletion. Furthermore, exploration and development expenditures are not deductible from the resource allowance base. As such, u is not reduced by $(1 - \psi)$ in the numerator and these expenses are written-off at a higher rate than the associated marginal revenues are taxed.

For conventional oil and gas, the tax adjusted user cost of capital for exploration is as follows:

$$(24)\ (c/q)\ (1 - g') = \frac{(r_f - \pi + \varepsilon)\ (1 - uZ_e)\ (1 - g')}{1 - g' - u_f(1 - \psi) - u_p(1 - g')}$$

while the user cost of development capital for conventional oil and gas is:

$$(25)\ (c/q)\ (1 - g') = \frac{(r_f - \pi + \varepsilon)\ (1 - uZ_d)\ (1 - g')}{1 - g' - u_f(1 - \psi) - u_p(1 - g')}$$

where Z_d is the present value of the CDE deductions ($Z_d = \alpha_d / (r_f + \alpha_d)$), and d is the CDE rate.

Inherent in equation (25) is the fact that exploration expenditures in the oil and gas industry are written-off immediately and are not deducted from the resource allowance base. Unlike mining, however, exploration expenditures in the conventional oil and gas sector do not earn depletion. Development expenditures receive similar treatment for tax purposes in both sectors. Rather than an immediate deduction, development expenses are written-off on a thirty per cent declining balance basis.

C. Assumptions

This section would be incomplete without a few remarks concerning some of the assumptions that were made in the calculation of marginal effective tax rates.

The Assumption of Tax Rules

For the pre-reform or base case scenario we use the corporate income tax system that would have been in existence if the changes announced in the 1986 federal budget were fully implemented. The post-reform scenario assumes that the corporate tax reforms proposed in the June 17, 1987 White Paper are fully implemented as well. In both cases, the provincial corporate tax rates that existed as of May 1987 were added to the relevant statutory federal rate. This means that the differences in marginal tax rates between the two cases are due only to federal corporate income tax changes. The marginal tax rates under tax reform may be even lower than the ones given here and in the White Paper if provinces reduce their statutory tax rates as a result of the corporate tax base broadening that is occurring. In fact, some provinces have announced corporate rate reductions. Two provinces, Ontario and Quebec, have also proposed accelerated or additional CCA write-offs on investment in machinery and equipment used in their province for manufacturing and processing activities.

The Assumption of Expected Inflation Rate

The expected inflation rate is 4.7% and is assumed to be constant in all calculations.[15] This figure is an average of forecasted inflation rates by various economic agencies at the time our calculations were made.

The Assumption of Corporate Financing

Corporations are assumed to finance new investment with a fixed debt/asset ratio of 41.2%. Moreover, the debt/asset ratio is the same for all corporations in every industry. This assumption ensures that any variation in marginal tax rates across industries is attributable to differences in their tax treatment and not to different debt/asset ratios. The alternative assumption would be to recognize the fact that firms have different abilities to issue debt and use sector specific debt/asset ratios in the calculations. In presenting these marginal tax rates, however, there could be some confusion because firms that are heavily debt financed would have lower marginal tax rates because of interest deductibility. Moreover, the wide range of debt/asset ratios tends to swamp the tax-related effects. To avoid this problem, we assume that the degree of debt is the same across firms even though firms which are able to deduct nominal interest receive a tax advantage. This advantage is therefore not reflected in our calculations which use a common debt/asset ratio. Our choice in the cost of financing assumption was guided by the fact that we are interested in examining the consequences of the tax reform proposals on the incentive to invest.

The Assumption of Fully Taxpaying Corporations

Corporations are assumed to be in a taxpaying position and are therefore able to take full advantage of all tax credits and deductions. On a marginal investment project, upfront deductions and tax credits may be so generous that no tax is paid on the income from that investment. The marginal tax rate may even be negative so that in effect, a subsidy is paid to the corporation on the marginal investment project. The tax lost in present value terms can be written off fully against the tax liability on taxable inframarginal investments or on other forms of capital held by the firm.

The assumption means that the corporation is in a taxable position or alternatively that the tax system is perfectly symmetrical with respect to profits and losses in the sense that it makes refunds at the same rate that profits are taxed. In practice, non-profitable firms may not be able to use all the credits and deductions they are entitled to. Tax losses may be carried forward and backward, however, so that unused credits and deductions are not necessarily lost.

The Assumption of Capital Market Equilibrium

The capital market equilibrium assumption (also known as the arbitrage assumption) is that Canada is a price-taker on international capital markets. Therefore the costs of debt and equity finance are exogenous to the economy. Moreover, it is assumed that the cost of financing through new equity issues and

retained earnings is the same. There are other arbitrage assumptions that could have been made and while the actual numbers themselves would have changed, the pattern of the results would have been the same.[16]

The Assumption of Risk

The nominal cost of equity includes a risk premium. The risk arises from "cash flow" risk in which all the components of the cash flow of the firm are viewed as equally risky. A common risk premium was used for the non-resource sector. A higher risk premium was used in the resource sector in recognition of the risky nature of the oil and gas and mining industries. Generally speaking, a higher risk premium will have the effect of increasing the required pre-tax rate of return on an investment. Risk assumptions used in other studies include "income risk" and "capital risk". Income risk arises from the uncertainty of future cash flows from an investment. Capital risk is associated with the uncertainty regarding economic depreciation or future changes in the prices of capital goods.[17]

V. SIMULATIONS

This section describes the scenarios that were run using the marginal tax rate model. The simulations use the Pre-Reform (Canada) data as the base case and then make appropriate modifications to reflect different tax rules or parameters. A further discussion of the base case data and its sources may be found in the Appendix.

A. Pre-Reform – Canada

The White Paper presents marginal effective corporate income tax rates under two alternative tax regimes, Pre-Reform and Reform. The Pre-Reform system represents the corporate tax system with all the measures announced in the February 1986 budget fully implemented. The basic statutory rate is 43% with a 10% abatement to allow the provinces room to levy their own corporate income tax at various rates. Profits attributed to manufacturing and processing activities are taxed at a rate of 36%. Small manufacturing business and other small business face an 18% and 23% tax rate, respectively. A 10% abatement also applies to the latter three rates. The statutory provincial rates also vary by firm size and type of activity. A weighted average provincial statutory rate is added to the above federal rates (minus the abatement) to obtain a combined federal/provincial statutory corporate income tax rate. The general investment tax credit is eliminated and the only remaining investment tax credits are regional ones. Qualifying investment in Atlantic Canada receives a 20% ITC while the Special ITC for manufacturing equipment in disadvantaged regions is

40%. Average effective ITC rates were used instead of statutory rates because not all expenditures within a CCA class are eligible for these tax credits. Accelerated capital cost allowances allow firms to write off capital equipment at rates that frequently exceed economic depreciation rates. For example, manufacturing and processing equipment may be written off in three years which is usually far shorter than its useful economic life. Many other types of machinery and equipment receive CCA write-offs in excess of their true economic depreciation. The 3% inventory allowance which was previously available to firms was eliminated in the 1986 federal budget and is not included in the calculations.

There are several special provisions in the Income Tax Act which apply only to the resource sector. In place of the deductibility of provincial royalties and mining taxes from federal taxable income, firms may deduct a resource allowance equal to 25 per cent of gross revenues less operating costs and CCA write-offs.[18] Some resource extraction assets receive CCA write-offs at rates that are accelerated relative to economic depreciation. Expenditures on exploration and development (depletable assets) are written off at accelerated rates ranging from 10 to 100 per cent. Finally, for qualifying exploration and development expenditures incurred by the mining and petroleum industries, firms are entitled to an earned depletion allowance, where eligible expenditures receive an additional deduction of 33 1/3 per cent.

B. Reform -- Canada

The Reform corporate income tax system used in the calculations is a system where all the relevant measures announced in the White Paper are fully phased in. The statutory tax rate on large corporations falls to 38% and on large manufacturing it becomes 33%. On all small corporations the statutory rate is 22%. These rates are reduced by 10 percentage points to make room for the provincial rates. The weighted average statutory provincial rate used in the Pre-Reform simulations was also used in the Reform calculations. All the regional investment tax credit rates are reduced by one-quarter of the Pre-Reform rates. The statutory rates for the Atlantic Canada ITC becomes 15% and the Special ITC is 30%. Capital Cost Allowance rates on the most important incentive classes are reduced. For example, manufacturing and processing equipment receives a 25% rate on a declining balance basis. In fact, with few exceptions a 25% declining balance rate is the highest CCA rate under the Reform System. Building construction and public utility property receive a 4% rate.

Under tax reform, CCA write-offs for resource extraction assets (Classes 10 and 28) are reduced from 30 to 25 per cent.[19] The cost of mine shafts and main haulage ways are treated as a Canadian Development Expense and are eligible for a 30 per cent write-off rate instead of a 100 per cent rate. The earned depletion allowance is eliminated in these simulations.

C. Pre-Reform – Provinces

The model was used to calculate marginal effective tax rates by province. Each province's statutory tax rate was used in place of the weighted average provincial tax rate for the combined federal/provincial rate. Average effective ITC rates by province were used in place of the Canada wide rates. These rates were calculated so that the resulting average effective rates were consistent with the statutory ITC rate in each province. Data on the provincial distribution of capital stock by sector were used in place of the Canada figures. The relative weight that a sector has in each province changes but details on firm size and capital stock weights were unchanged.

D. Reform – Provinces

In the Reform simulations, the average effective provincial ITC rates were reduced by one-quarter to reflect the change in statutory ITC rates. No other changes were made to the provincial input data. Federal statutory tax rates and new CCA rates were the same as the ones used for the Reform – Canada simulation.

E. Pre-Reform – Comparison of Tax Rates Between the U.S. and Canada

The model was also used to calculate marginal effective tax rates in the United States. More precisely, the model was used to calculate what marginal

tax rates would be in Canada if the U.S. tax system was substituted for the Canadian system. Canadian weights were used for capital stock, industry distribution, and the proportion of large and small firms. Canadian data such as the inflation rate, the return on debt and equity, depreciation rates, and the debt to asset ratio were also used. Because Canadian data and weights were used, the resulting marginal tax rates may be different from ones obtained by using U.S. parameters. It is important to note that the U.S. Pre- and Post-Reform marginal tax rates are not the actual marginal tax rates that would exist in that country. A comparison of these U.S. and Canadian Pre-Reform and Reform results are useful in that differences in the marginal tax rates are due to corporate income tax law differences between the two countries. The Canada/U.S. comparison attempts to answer the following question: What would the marginal tax rates be in the two countries if they both had the Canadian mix of assets, industries, economic depreciation rates, inflation rate, and cost of finance? This is not the same question as asking what are the actual marginal tax rates in the two countries.

Using Canadian weights, U.S. tax rules and parameters were imposed in place of the Canadian ones. The U.S. federal tax rate (pre-reform) was 46% for profits in excess of $100,000. An average state corporate income tax rate of 7.0% was added to this figure. At the federal level, however, there is a deduction for state taxes so that the combined federal/state statutory tax rate was actually 49.8%. A lower average state tax rate (4.7%) was applied to the resource sector which reflects the weighted overall statutory tax rate for the 24 states that account for the majority of U.S. resource production. For

qualifying property, the investment tax credit was available at a 10% rate except for three year property[20] where the rate was 6%. The statutory rates were adjusted downward to reflect the ineligibility of used property for investment tax credits. The ITC reduced the basis of depreciation calculations by one-half of the value of the credit. Depreciation allowances were granted under a system known as Accelerated Cost Recovery System (ACRS). Briefly, all personal property except for public utility property was written off over three or five years. Most real property was written off over 18 years. The actual ACRS depreciation formulas were used in the calculations. Finally, an adjustment was made for inventory investment owing to the use of LIFO (last in, first out) accounting techniques by many firms. The use of LIFO instead of FIFO for the valuation of the cost of holding inventory reduces the taxation of the inflationary component of inventory capital.

F. Reform -- Comparison of Tax Rates Between the U.S. and Canada

The U.S. statutory federal rate decreases under reform to 34%. No change was made to the average state tax rate. Write-offs for depreciation purposes were altered to reflect the modified ACRS rules. Some assets were reclassified and new classes were created. Finally, the ITC rates were set to zero for all asset classes.

DATA APPENDIX

In this Appendix, data sources and inputs to the main calculations are described.

A. Aggregation Structure and Capital Stock Weights

We consider a series of hypothetical investment projects by the corporate sector. These investment projects have three different characteristics:

(1) the industry making the investment – by SIC code.

(2) the type of asset purchased – by CCA class for buildings and machinery, as well as land, inventories, and depletables (namely, Canadian Exploration Expenses and Canadian Development Expenses).

(3) the size of the firm -- large or small (the latter being those firms qualifying for the small business deduction).

In the calculations made for small firms, it is assumed that the last dollar of income qualifies for the small business deduction. In total we have 2,170 investment combinations[21] (35 industries x 31 types of capital x 2 firm sizes).

The mean of the distribution of the marginal effective tax rates provides an estimate of the overall marginal tax rate generated from a small

equiproportionate increase in the capital stock. If w is the capital stock weight for a particular combination of asset, industry, and firm size, then the overall marginal tax rate, t^*, is:

$$t^* = \Sigma (r_g - r_n) w / \Sigma r_g w$$

Conditional means may also be computed by summing over the appropriate subset of combinations. For example, the overall marginal tax rate for large corporations in retail trade may be computed by taking a weighted average of all possible projects involving this industry and firm size. There are 31 such possible combinations.

The finest level of industry disaggregation corresponds to the 1970 Standard Industrial Classification (SIC) of major industry groups excluding Finance (SIC 704-799). The 35 industries were then aggregated into 11 broader industrial divisions. Details of the structure of aggregation for these divisions are given in Table A-1. Aggregation weights (Table A-2) were calculated for each combination of 35 industries x 2 firm sizes x 31 asset categories. The two firm sizes are large and small with the latter being those corporations qualifying for the small business deduction. The asset categories were composed of 28 CCA classes, inventory, land, and depletables. The CCA classes were aggregated into two broad categories of depreciable assets: buildings and machinery. Table A-3 outlines the aggregation structure for the 28 CCA classes.

Capital stock levels net of depreciation for buildings and machinery, inventory and land holdings were derived from Revenue Canada's Corporation

Statistics Sample and from published Statistics Canada information. Generally speaking, building construction and engineering construction were aggregated to form the buildings category.[22] Weights for individual CCA classes within the buildings and equipment categories were assigned using data on the level of CCA additions in each class from Revenue Canada's Corporation Statistics Sample. While the above method uses both stocks and flows to assign aggregation weights, capital stock weights by CCA class were not available. The use of flows may bias the weights for some classes. To minimize this possibility, a three year average (1979-81) of CCA additions was used. Within each industry, large and small firms had an identical breakdown for broad capital types but separate data were available for the breakdown by CCA class.

B. Capital Cost Allowances

The present value of CCA deductions was calculated for each combination of industry, firm size, and capital type. The depreciation method (declining balance or straight-line) and CCA rates used were the statutory ones. The CCA deductions were discounted by the nominal after-tax cost of finance to the firm. Table A-3 also gives the aggregation structure, CCA rates, and basis for each class of assets for both Pre-Reform and Reform that were used in the calculation of marginal tax rates.

Statutory CCA write-off rates were also used in the calculation of U.S. marginal tax rates. Personal property was written off at either a 200 per cent

or 150 per cent on a declining balance basis with a later switch to straight-line. Real property was written off on a straight-line basis.

C. Expected Inflation Rate

The expected inflation rate used in all the simulations was 4.7%. This inflation rate was an average of forecasts made by various economic agencies at the time our calculations were made.

D. Nominal Interest Rate on Canadian Corporate Debt

The nominal interest rate used was 12%. This rate was calculated by taking an unweighted average long-term corporate bond rate from The Bank of Canada Review (Table F1, "Selected Canadian and International Interest Rates, Including Bond Yields and Interest Arbitrage") for 1984-86. Simulations using more current interest rates had little effect on the marginal tax rates.

E. Nominal Return on Canadian Equity

The nominal return on Canadian equity was calculated applying two sectoral capital asset pricing models to Canadian stock prices. The capital asset pricing model computes the required rate of return on equity as the sum of a riskless rate of return plus a risk premium. The risk premium is composed of two elements: a market-wide risk premium and a firm or industry-specific risk factor.

The three month treasury bill rate was used for the risk-free rate of return. The average over 1985-86, 9.3%, was taken from The Bank of Canada Review ("Selected Canadian and International Interest Rates"). For the non-resource sector, a risk premium of 7% was used based on calculations by Calvet and Lefoll (1984) for 1971 to 1980. In the resource sector, a risk premium of 9.3% was used based on Parker (1984). The nominal cost of equity for the non-resource and resource sector was therefore 16.3% and 18.6%, respectively.

F. Corporate Income Tax Rates

A combined federal and provincial corporate income tax rate was calculated for each industry and firm size. The federal rate was adjusted for the manufacturing and processing deduction and the provincial rate was a weighted average of the provincial statutory tax rates. The adjustment to the federal rate was made by multiplying the basic federal rate by one minus the federal manufacturing deduction divided by total taxable income. Data on the manufacturing deduction as well as total taxable income by industry and firm size were taken for the 1981 tax year from Revenue Canada's Corporation Statistics Sample. A small business deduction is available to Canadian-controlled private corporations. Regardless of size, eligible firms pay a lower statutory tax rate on the first $200,000 of active business income.

The average provincial statutory tax rate was calculated by taking a weighted average of the statutory corporate tax rates applicable in the ten provinces (Table A-4), with the industry (manufacturing, other non-resource, and resource) as well as firm size taken into account. The weights used were the shares of provincial taxable income as a proportion of total taxable income by industry (Table A-5). The use of provincial capital stock weights instead of taxable income shares leads to virtually the same weighted average provincial tax rate. Statutory provincial rates as of May 1987 were used in both the Pre-Reform and Reform simulations. This ensures that any change in marginal tax rates in any sector is due to changes in the federal corporate income tax system and not to provincial statutory tax rate changes that occurred between February 1986 and May 1987. The disadvantage to this approach is, of course, that the Pre-Reform tax rates are not the ones that would have actually existed. The marginal tax rates in the Reform simulations also do not factor in any other changes in either provincial statutory tax rates or provincial incentives that occurred after May 1987.

G. Investment Tax Credit Rates

In the Pre-Reform or base case system, the general ITC is phased out, and only the Atlantic Canada and Special ITC remain. Statutory ITC rates could not be used because the investment tax credit is not available for all types of depreciable assets. Average effective ITC rates by industry, firm size and CCA class were computed using information for 1979-1981, years in which the general ITC still existed. The average ITC rates were calculated by dividing total ITC

earned into total additions to each CCA class. These rates were then adjusted to reflect only the regional ITC rates that remained in the Pre-Reform scenario. Table A-6 gives the average effective ITC rates. In the Reform simulations, the ITC rates were multiplied by .75 as a result of the reduction in the statutory ITC rates.

Average effective ITC rates by province were calculated in the following way. The Canadian figures for CCA additions and earned ITC were distributed by province. Unfortunately, no information is available on CCA distributions at the provincial level. Instead, we assumed that CCA additions were similar to the provincial distribution of capital stock. Next, the earned ITC were distributed in such a way that the resulting average effective ITC rates between provinces would have the same relationship to each other that the statutory rates have. For example, the statutory ITC rate in Newfoundland before tax reform was 20 per cent and in Ontario it was 7 per cent. The derived before tax reform average effective ITC rate for a given industry in Newfoundland should therefore be nearly three times the rate for the same industry in Ontario. A correction was then made for the impact of the Special Investment Tax Credit on the average effective ITC rate.

Table A-6 also contains the average effective ITC rates for the U.S. taking into account the ineligibility of used property for investment tax credits.

H. Economic Depreciation Rates

Estimates by industry and capital type for economic depreciation rates were made (Table A-7). In most cases, direct estimates using data from Hulten and Wykoff (1981) for machinery and some building classes were used. Hulten and Wykoff estimate true depreciation based on an economic evaluation of asset prices taking inflation and depreciation into account. This approach can lead to underestimates of depreciation rates, however, if repair and maintenance is undertaken to maintain the quality of the asset. This is especially true for building construction. Statistics Canada data on the service lives for non-residential buildings were used in addition to the Hulten and Wykoff estimates. An average of the two depreciation rates was used in the calculations. For asset classes where Hulten and Wykoff estimates were not available, the depreciation rates used were 2/T where T is the estimated service life of the capital good.

I. Debt and Equity Financing Ratios

The debt to asset ratio was calculated by taking the ratio of short and long term debt net of deferred tax liabilities divided by assets net of deferred tax liabilities. A correction was made to reflect the possibility that some financial assets may be more highly debt financed than real capital. The resulting debt to asset ratio of .412 was used in our calculations.

TABLE A-1

INDUSTRIAL AGGREGATION STRUCTURE

SIC Code	Industry Name	Division Name (Abbreviation)
001-021	agriculture	agri., for., & fish. (A,F&F)
031-039	forestry	agri., for., & fish. (A,F&F)
041-047	fishing and trapping	agri., for., & fish. (A,F&F)
101-139	food industries	manufacturing (manufac)
141-147	beverage manufacturers	manufacturing (manufac)
151-153	tobacco products industries	manufacturing (manufac)
161-169	rubber industries	manufacturing (manufac)
172-179	leather industries	manufacturing (manufac)
183-229	textile industries	manufacturing (manufac)
231-239	knitting mills	manufacturing (manufac)
242-249	clothing industries	manufacturing (manufac)
251-259	wood industries	manufacturing (manufac)
261-268	furniture and fixture industries	manufacturing (manufac)
271-274	paper and allied industries	manufacturing (manufac)
286-289	print, publishing and allied industries	manufacturing (manufac)
291-298	primary metal industries	manufacturing (manufac)
301-309	metal fabricating industries	manufacturing (manufac)
311-318	machinery industries	manufacturing (manufac)
321-329	transportation equipment industries	manufacturing (manufac)
331-339	electrical products industries	manufacturing (manufac)
341-359	non-metallic mineral products industries	manufacturing (manufac)
365-369	petroleum and coal products industries	manufacturing (manufac)
371-379	chemical and chemical products industries	manufacturing (manufac)
381-399	miscellaneous manufacturing industries	manufacturing (manufac)
404-421	construction industry	construction (constr)
501-519	transportation	transportation and storage (tr&stor)
524-527	storage	transportation and storage (tr&stor)
543-548	communication	communication (comm)
572-579	electric power, gas and water utilities	public utilities (pub utl)
602-629	wholesale trade	wholesale trade (ws trade)
631-699	retail trade	retail trade (rt trade)
861-869	services to business management	service industries (service)
801-859	gov't, personal and misc. services	service industries (service)
051-061	mining	mining (mining)
064	oil and gas	oil and gas (oil & gas)

TABLE A-2a CAPITAL STOCK WEIGHTS
(Small Corporations)

	A,F&F	MANUFAC	CONSTR	TR&STOR	COMM	PUB UTL	WSTRADE	RTTRADE	SERVICE	MINING	OIL&GAS	TOTAL
CCA 1	0.00	0.01	0.00	0.02	0.00	-	0.01	0.01	0.04	-	-	0.08
CCA 3	0.17	0.83	0.13	0.66	0.05	0.01	0.60	0.72	1.03	-	-	4.20
CCA 6	0.43	0.15	0.06	0.12	0.00	0.00	0.16	0.27	0.27	-	-	1.47
CCA 13	0.01	0.12	0.01	0.10	0.01	0.00	0.15	0.27	0.21	-	-	0.88
CCA 31	0.01	0.00	0.00	0.02	-	-	0.01	0.01	0.02	-	-	0.07
CCA 32	0.01	-	0.01	-	-	-	-	0.00	0.00	-	-	0.02
CCA 2	0.00	0.00	0.00	0.02	-	0.01	-	0.00	0.00	-	-	0.04
CCA 26	-	-	-	-	-	-	-	-	-	-	-	-
CCA 4	0.00	-	-	0.00	-	-	0.00	-	-	-	-	0.00
CCA 7	0.05	0.02	0.00	0.02	0.00	-	0.00	0.00	0.03	-	-	0.13
CCA 8	0.17	0.19	0.06	0.01	0.03	0.00	0.06	0.15	0.43	-	-	1.09
CCA 9	0.00	0.03	0.01	0.06	0.01	0.00	0.00	0.00	0.02	-	-	0.12
CCA 10	0.36	0.21	0.30	0.20	0.00	0.00	0.19	0.27	0.92	-	-	2.46
CCA 11	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	0.00
CCA 12	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.02	-	-	0.10
CCA 15	0.00	0.00	0.00	-	-	-	-	-	-	-	-	0.00
CCA 16	0.00	0.00	0.00	0.00	-	-	-	0.00	0.00	-	-	0.01
CCA 17	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.02	-	-	0.04
CCA 18	-	-	-	-	-	-	-	-	-	-	-	-
CCA 22	0.02	0.04	0.24	0.01	0.00	0.00	0.04	0.00	0.07	-	-	0.41
CCA 24	0.00	0.00	-	-	-	-	0.00	-	0.00	-	-	0.00
CCA 25	-	-	-	-	-	-	-	-	-	-	-	-
CCA 27	0.00	0.00	0.00	-	-	-	-	0.00	0.00	-	-	0.00
CCA 29	0.01	0.76	0.01	0.00	0.00	0.00	0.03	0.01	0.05	-	-	0.87
CCA 30	0.00	0.00	-	-	-	-	-	-	0.00	-	-	0.00
CCA 34	0.00	0.00	-	-	-	-	-	-	-	-	-	0.00
CCA 35	-	-	-	-	-	-	0.00	-	0.00	-	-	0.00
CCA 28	-	-	-	-	-	-	-	-	-	-	-	-
EXP,D&P	-	-	-	-	-	-	-	-	-	-	-	-
LAND	2.29	0.38	0.14	0.06	0.00	0.00	0.45	0.68	0.71	-	-	4.71
INVENT	0.33	1.30	0.76	0.04	0.00	0.00	1.60	1.78	0.21	-	-	6.03
TOTAL	3.86	4.12	1.74	1.36	0.11	0.04	3.31	4.18	4.04	-	-	22.75

TABLE A-2b CAPITAL STOCK WEIGHTS
(Large Corporations)

	A,F&F	MANUFAC	CONSTR	TR&STOR	COMM	PUB UTL	WSTRADE	RTTRADE	SERVICE	MINING	OIL&GAS	TOTAL
CCA 1	0.00	0.15	0.00	1.77	0.00	0.00	0.02	0.00	0.00	0.00	0.00	1.95
CCA 3	0.03	6.90	0.08	1.27	3.16	0.02	1.09	0.56	0.81	0.10	0.09	14.11
CCA 6	0.04	0.64	0.01	1.01	0.02	0.01	0.17	0.06	0.03	0.05	0.02	2.06
CCA 13	0.00	0.35	0.01	0.21	0.06	0.00	0.15	0.42	0.18	0.01	0.03	1.43
CCA 31	0.00	-	0.03	0.00	-	-	0.00	0.00	0.00	-	0.01	0.06
CCA 32	0.00	0.00	0.00	-	-	-	0.00	-	0.00	-	0.01	0.02
CCA 2	0.00	0.17	0.00	1.73	-	2.22	0.01	0.01	0.00	0.00	0.03	4.17
CCA 26	-	0.01	0.00	-	-	-	-	-	-	0.00	0.00	0.02
CCA 4	-	0.00	-	0.00	-	0.00	0.00	-	-	-	0.00	0.00
CCA 7	0.01	0.11	0.00	0.26	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.40
CCA 8	0.02	0.78	0.03	0.28	1.32	0.19	0.10	0.20	0.26	0.10	0.15	3.44
CCA 9	0.00	0.05	0.00	0.67	0.10	0.00	0.00	0.00	0.01	0.04	0.03	0.91
CCA 10	0.07	2.16	0.13	0.32	0.22	0.21	0.15	0.14	0.63	3.00	1.87	8.89
CCA 11	-	0.00	-	0.00	-	-	0.00	0.00	0.00	-	-	0.00
CCA 12	0.00	0.50	0.00	0.00	0.01	0.00	0.01	0.01	0.04	0.34	0.01	0.91
CCA 15	0.00	0.00	-	-	-	-	-	-	0.00	-	-	0.00
CCA 16	0.00	0.00	-	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.03
CCA 17	0.00	0.15	0.00	0.20	0.44	0.00	0.01	0.00	0.00	0.01	0.04	0.84
CCA 18	-	-	-	-	-	-	-	-	-	-	-	-
CCA 22	0.01	0.09	0.16	0.00	0.00	0.00	0.14	0.00	0.01	0.11	0.00	0.53
CCA 24	0.00	0.11	0.00	0.00	-	0.02	0.00	0.00	0.00	0.02	0.01	0.16
CCA 25	-	-	-	-	-	-	-	-	-	-	-	-
CCA 27	0.00	0.07	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.12
CCA 29	0.01	7.88	0.05	0.01	0.01	0.02	0.09	0.02	0.04	0.14	0.55	8.80
CCA 30	-	-	-	-	0.04	-	-	-	-	-	-	0.04
CCA 34	-	0.03	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.04
CCA 35	0.00	0.06	-	0.20	-	-	0.00	-	0.04	-	-	0.30
CCA 28	-	-	-	-	-	-	-	-	-	0.48	0.41	0.89
EXP,D&P	-	-	-	-	-	-	-	-	-	1.95	6.65	8.60
LAND	0.23	1.45	0.08	0.42	0.12	0.01	0.69	0.56	0.45	0.11	0.23	4.35
INVENT	0.04	8.10	0.46	0.43	0.00	0.11	2.45	1.48	0.15	0.70	0.24	14.15
TOTAL	0.47	29.76	1.04	8.79	5.52	2.87	5.07	3.46	2.66	7.19	10.41	77.25

TABLE A-2c CAPITAL STOCK WEIGHTS
(All Corporations)

	A,F&F	MANUFAC	CONSTR	TR&STOR	COMM	PUB UTL	WSTRADE	RTTRADE	SERVICE	MINING	OIL&GAS	TOTAL
CCA 1	0.00	0.16	0.00	1.79	0.00	0.00	0.02	0.01	0.04	0.00	0.00	2.03
CCA 3	0.19	7.73	0.21	1.93	3.20	0.04	1.69	1.28	1.84	0.10	0.09	18.31
CCA 6	0.47	0.79	0.07	1.13	0.03	0.01	0.33	0.33	0.30	0.05	0.02	3.53
CCA 13	0.01	0.47	0.01	0.32	0.07	0.01	0.30	0.68	0.39	0.01	0.03	2.31
CCA 31	0.01	0.00	0.03	0.02	-	-	0.02	0.01	0.03	-	0.01	0.13
CCA 32	0.01	0.00	0.01	-	-	-	0.00	0.00	0.00	-	0.01	0.04
CCA 2	0.00	0.17	0.00	1.75	-	2.23	0.01	0.01	0.00	0.00	0.03	4.21
CCA 26	-	0.01	0.00	-	-	-	-	-	-	0.00	0.00	0.02
CCA 4	0.00	0.00	-	0.00	-	0.00	0.00	-	-	-	0.00	0.00
CCA 7	0.06	0.14	0.00	0.28	0.00	0.00	0.01	0.00	0.03	0.00	0.01	0.53
CCA 8	0.19	0.97	0.08	0.29	1.35	0.20	0.17	0.35	0.69	0.10	0.15	4.53
CCA 9	0.00	0.08	0.01	0.73	0.10	0.00	0.00	0.00	0.03	0.04	0.03	1.02
CCA 10	0.43	2.37	0.43	0.53	0.22	0.22	0.34	0.41	1.55	3.00	1.87	11.35
CCA 11	0.00	0.01	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	0.01
CCA 12	0.00	0.57	0.01	0.00	0.01	0.00	0.01	0.01	0.06	0.34	0.01	1.01
CCA 15	0.00	0.00	0.00	-	-	-	-	-	0.00	-	-	0.00
CCA 16	0.00	0.00	0.00	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.04
CCA 17	0.00	0.16	0.01	0.20	0.44	0.00	0.01	0.01	0.02	0.01	0.04	0.88
CCA 18	-	-	-	-	-	-	-	-	-	-	-	-
CCA 22	0.03	0.13	0.40	0.02	0.00	0.00	0.18	0.00	0.07	0.11	0.00	0.94
CCA 24	0.00	0.11	0.00	0.00	-	0.02	0.00	0.00	0.00	0.02	0.01	0.16
CCA 25	-	-	-	-	-	-	-	-	-	-	-	-
CCA 27	0.00	0.07	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.12
CCA 29	0.02	8.63	0.06	0.01	0.01	0.02	0.12	0.03	0.09	0.14	0.55	9.67
CCA 30	0.00	0.00	-	-	0.04	-	-	-	0.00	-	-	0.04
CCA 34	0.00	0.03	-	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.04
CCA 35	0.00	0.06	-	0.20	-	-	0.00	-	0.04	-	-	0.30
CCA 28	-	-	-	-	-	-	-	-	-	0.48	0.41	0.89
EXP,D&P	-	-	-	-	-	-	-	-	-	1.95	6.65	8.60
LAND	2.52	1.83	0.22	0.48	0.12	0.02	1.14	1.24	1.16	0.11	0.23	9.06
INVENT	0.38	9.40	1.22	0.47	0.00	0.11	4.04	3.26	0.36	0.70	0.24	20.19
TOTAL	4.33	33.88	2.78	10.15	5.62	2.91	8.38	7.64	6.70	7.19	10.41	100.00

TABLE A-2d

Distribution of Capital Stock Among Industrial Divisions by Province (All Corporations)

	B.C.	Alta	Sask.	Man.	Ont.	Que.	N.B.	N.S.	P.E.I.	Nfld.
					(per cent)					
A,F&F	4.2	4.0	19.6	9.6	3.3	2.8	4.2	4.6	23.9	1.7
Manufac	26.6	8.6	8.2	27.0	49.5	41.6	24.8	30.6	18.6	13.6
Constr	3.8	3.7	3.1	2.0	2.1	2.4	3.6	4.8	4.7	3.2
Tr&Sto	11.8	5.1	10.1	13.3	9.2	13.3	13.1	14.0	9.1	25.1
Comm	6.5	2.9	5.6	7.4	5.1	7.4	7.2	7.8	5.0	13.9
PubUtil	5.0	2.4	4.4	5.5	2.1	2.7	4.6	4.8	3.8	2.6
WsTrade	10.1	5.0	7.5	10.7	8.8	9.2	10.6	12.9	14.6	7.6
RtTrade	9.2	4.5	6.8	9.8	8.0	8.4	9.6	11.8	13.3	6.9
Service	7.4	3.9	4.6	6.7	7.7	7.8	5.7	8.8	7.1	2.5
Mining	12.1	9.7	16.5	8.1	4.2	4.5	16.7	-	-	23.0
Oil&Gas	3.4	50.2	13.7	-	-	-	-	-	-	-
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note: Details may not add due to rounding.

Source: Estimates for the year 1982 developed within the Department of Finance.

TABLE A-3

AGGREGATION STRUCTURE OF CAPITAL CLASSES

Fine Capital Type		CCA Rate Pre-Reform		CCA Rate Reform (if different)		Class Description
cca - 1	buildings	.04	DB			transportation structures (road bridges, canals etc) and railway equipment
cca - 3	buildings	.05	DB	.04	DB	solid buildings, windmills, telephone structures
cca - 6	buildings	.10	DB			farming and fishing, no foundation buildings, fences, storage tanks non-automotive locomotive
cca - 13	buildings	-	SL			lease hold interest and structural improvements
cca - 31	buildings	.05	DB			murb
cca - 32	buildings	.10	DB			murb
cca - 2	buildings	.06	DB	.04	DB	electric, hydro utilities
cca - 26	buildings	.05	DB			catalyst or enriched water
cca - 4	machines	.06	DB			trams or trolleys
cca - 7	machines	.30	DB	.25	DB	vessels and fittings
cca - 8	machines	.20	DB			manufacturing equipment, silos and other property, vegetable storage structures for growers, electrical generating equipment, radio communication equipment, kilns, vats
cca - 9	machines	.25	DB			aircraft and accessories
cca - 10	machines	.30	DB	.25 (for resource extraction assets)	DB*	automotive equipment, rent earning portable tools, wagons, trailers, motion pictures and video tapes, data processing equipment and software, moveable construction equipment, logging equipment and roads, mining and oil and gas structures and equipment, drive-in equipment

Aggregation Structure of Capital Classes (continued)

cca - 11	machines	.35	DB	.20	DB	rental signs
cca - 12	machines	1.00	DB	half year rule		books, utensils, cheap tools, apparel, computer software, metric scales, certified feature films, mineshafts
cca - 15	machines	1.00	DB			timber resource property
cca - 16	machines	.40	DB			taxicab, auto for rent/lease
cca - 17	machines	.08	DB			telephone, telegraph or data communications switching equipment, roads, sidewalks, runways, parking lots
cca - 18	machines	.60	DB			dead
cca - 22	machines	.50	DB	.30	DB	movable power operated construction equipment
cca - 24	machines	2 yrs	SL			pollution control equipment
cca - 25	machines	1.00	DB			dead
cca - 27	machines	2 yrs	SL			pollution control equipment
cca - 29	machines	2 yrs	SL	.25	DB	manufacturing equipment, oil or water storage tanks, power operated lift equipment, electrical generating equipment
cca - 30	machines	.40	DB	.30	DB	satellites
cca - 34	machines	2 yrs	SL			energy efficient equipment
cca - 35	machines	.07	DB			railway cars
cca - 28	machines	.30	DB	.25	DB	equipment and property used in a new mine or major mine expansion
proces.	machines	.30	DB			processing assets in mining industr
land	land					
invent.	inventories					

Note:

DB - declining balance
SL - straight line

TABLE A3 (continued) CANADA TO US CCA CLASS CORRESPONDENCE

Class	ASSET LIFE	
	Pre-Reform (1)	Reform (2)
1	5, 19	15
3	15, 19	31.5
6	5, 19	7, 20, 31.5
31	19	31.5
32	19	31.5
2	5, 10	15
26	5, 15	7
4	5	10
7	5	10
8	5	5, 7
9	5	5, 7
10	3, 5	3, 5
11	19	15
12	3, 5	3, 5, 7, 10
16	3	3
17	5, 19	10, 15
22	5	5
24	6	5 sl
27	6	5 sl
29	3, 5	5, 7, 10
30	5, 19	5
34	5, 15	5, 7, 20
35	10	7
28	5, 15	5, 15

Notes:

(1) Asset lives under Accelerated Cost Recovery System (ACRS). The cost of property is recovered for 3, 5, 10, and 15 year property based on the 150% declining balance method. Property in the 19 year class is based on the 175% declining balance method.

(2) Asset lives under Modified Accelerated Cost Recovery System (MACRS). Property in 3, 5, 7, and 10 year classes are written off using the 200% declining balance method; 15 and 20 year property use the 150% declining balance method; 27.5 and 31.5 year property use the straight line method.

TABLE A-4

STATUTORY PROVINCIAL TAX RATES AS OF MAY 1987 (PER CENT)

	Province	Manufacturing large	Manufacturing small	Non-Manufacturing large	Non-Manufacturing small
1	British Columbia	15	8	15	8
2	Alberta	9	0	15	5
3	Saskatchewan	17	0	17	10
4	Manitoba	17	10	17	10
5	Ontario	14.5	10	15.5	10
6	Quebec	5.5	3	5.5	3
7	New Brunswick	15	9	15	9
8	Nova Scotia	15	10	15	10
9	Prince Edward Island	15	10	15	10
10	Newfoundland	16	10	16	10
11	Northwest Territories	10	10	10	10
12	Yukon Territories	2.5	2.5	10	5

Note: In Ontario a rate of 14.5 applies to large firms in resource extraction, farming, logging and fishing.

TABLE A-5

PROVINCIAL SHARES OF TAXABLE INCOME

(per cent)

	Province	Share
1	British Columbia	12.6516
2	Alberta	21.7003
3	Saskatchewan	3.4341
4	Manitoba	2.9383
5	Ontario	35.1248
6	Quebec	18.5517
7	New Brunswick	1.8213
8	Nova Scotia	2.0305
9	Prince Edward Island	0.2012
10	Newfoundland	1.0228
11	Northwest Territories	0.3696
12	Yukon Territories	0.1538

Source: For the year 1981 from a sample of corporate tax return estimates developed by Revenue Canada.

TABLE A-6a AVERAGE EFFECTIVE INVESTMENT TAX CREDIT RATES (%)
(Small Corporations)

	A,F&F	MANUFAC	CONSTR	TR&STOR	COMM	PUB UTL	WSTRADE	RTTRADE	SERVICE	MINING	OIL&GAS	TOTAL
CCA 1	0.03	0.28	0.00	0.00	0.00	-	0.37	0.00	0.00	-	-	0.06
CCA 3	0.31	0.99	0.00	0.00	0.01	0.02	0.30	0.08	0.00	-	-	0.27
CCA 6	0.47	0.59	0.01	0.04	0.02	0.07	0.38	0.07	0.00	-	-	0.26
CCA 13	0.02	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.02
CCA 31	0.00	0.00	0.00	0.00	-	-	0.00	0.00	0.00	-	-	0.00
CCA 32	0.00	-	0.00	-	-	-	-	0.00	0.00	-	-	0.00
CCA 2	0.05	1.49	0.00	0.00	-	0.00	-	0.00	0.00	-	-	0.05
CCA 26	-	-	-	-	-	-	-	-	-	-	-	-
CCA 4	0.00	-	-	0.00	-	-	0.00	-	-	-	-	0.00
CCA 7	0.57	0.11	0.00	0.18	0.00	-	0.00	0.00	0.00	-	-	0.27
CCA 8	0.71	0.18	0.04	0.06	0.00	0.12	0.08	0.01	0.00	-	-	0.15
CCA 9	0.47	1.11	0.06	0.54	0.00	0.00	0.33	0.00	0.00	-	-	0.53
CCA 10	0.49	0.14	0.06	0.53	0.00	0.04	0.07	0.02	0.00	-	-	0.14
CCA 11	0.00	0.02	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	0.01
CCA 12	0.00	0.14	0.00	0.00	0.00	0.00	0.02	0.15	0.00	-	-	0.10
CCA 15	0.00	0.00	0.00	-	-	-	-	-	-	-	-	0.00
CCA 16	0.00	0.00	0.00	0.00	-	-	-	0.00	0.00	-	-	0.00
CCA 17	0.34	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	0.02
CCA 18	-	-	-	-	-	-	-	-	-	-	-	-
CCA 22	0.86	1.47	1.21	1.53	1.21	1.13	1.09	0.76	0.00	-	-	1.03
CCA 24	0.40	0.15	-	-	-	-	1.06	-	0.00	-	-	0.32
CCA 25	-	-	-	-	-	-	-	-	-	-	-	-
CCA 27	1.22	1.34	1.21	-	-	-	-	0.00	0.00	-	-	0.99
CCA 29	0.71	1.25	0.84	1.42	1.36	0.91	1.01	0.37	0.00	-	-	1.16
CCA 30	0.00	0.00	-	-	-	-	-	-	0.00	-	-	0.00
CCA 34	0.79	1.32	-	-	-	-	-	-	-	-	-	1.12
CCA 35	-	-	-	-	-	-	0.00	-	0.00	-	-	0.00
CCA 28	-	-	-	-	-	-	-	-	-	-	-	-
EXP,D&P	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	0.49	0.84	0.39	0.13	0.03	0.03	0.27	0.05	0.00	-	-	0.30

TABLE A-6b AVERAGE EFFECTIVE INVESTMENT TAX CREDIT RATES (%)
(Large Corporations)

	A,F&F	MANUFAC	CONSTR	TR&STOR	COMM	PUB UTL	WSTRADE	RTTRADE	SERVICE	MINING	OIL&GAS	TOTAL
CCA 1	0.00	0.22	0.03	0.72	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.67
CCA 3	0.53	0.97	0.04	0.05	0.00	0.00	0.26	0.02	0.00	0.71	0.00	0.50
CCA 6	0.37	0.57	0.00	0.42	0.00	0.00	0.24	0.03	0.00	0.40	0.00	0.42
CCA 13	0.03	0.02	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
CCA 31	0.00	-	0.00	0.00	-	-	0.00	0.00	0.00	-	0.00	0.00
CCA 32	0.00	0.00	0.00	-	-	-	0.00	-	0.00	-	0.00	0.00
CCA 2	0.01	0.15	0.00	0.00	-	0.00	0.02	0.23	0.00	0.34	0.00	0.01
CCA 26	-	0.04	0.00	-	-	-	-	-	-	0.00	0.00	0.03
CCA 4	-	0.03	-	0.00	-	0.00	0.00	-	-	-	0.00	0.01
CCA 7	1.42	1.23	0.00	0.46	0.00	0.00	0.14	0.70	0.00	0.75	0.00	0.68
CCA 8	0.50	0.14	0.13	0.09	0.01	0.00	0.20	0.01	0.00	0.32	0.00	0.06
CCA 9	0.58	0.17	0.01	0.49	0.01	0.00	0.00	0.00	0.00	0.32	0.00	0.39
CCA 10	0.35	0.92	0.06	0.71	0.00	0.57	0.25	0.02	0.00	1.31	0.00	0.71
CCA 11	-	0.00	-	0.00	-	-	0.00	0.00	0.00	-	-	0.00
CCA 12	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
CCA 15	0.00	0.00	-	-	-	-	-	-	0.00	-	-	0.00
CCA 16	0.18	0.04	-	0.00	0.00	0.00	0.00	0.00	0.00	1.46	0.00	0.03
CCA 17	0.00	0.03	0.00	0.03	0.00	0.00	0.02	0.00	0.00	0.02	0.00	0.01
CCA 18	-	-	-	-	-	-	-	-	-	-	-	-
CCA 22	0.86	1.47	1.21	1.53	1.21	1.13	1.09	0.76	0.00	0.97	0.00	1.14
CCA 24	0.00	1.22	0.00	0.00	-	0.00	0.55	0.00	0.00	2.03	0.00	1.11
CCA 25	-	-	-	-	-	-	-	-	-	-	-	-
CCA 27	0.62	1.36	0.09	0.28	0.00	0.00	1.35	0.00	0.00	1.52	0.00	0.90
CCA 29	0.94	1.23	0.87	1.00	1.07	1.53	0.79	0.72	0.00	1.71	0.00	1.14
CCA 30	-	-	-	-	0.00	-	-	-	-	-	-	0.00
CCA 34	-	1.41	-	0.00	0.00	0.00	1.07	0.00	0.00	-	-	1.24
CCA 35	0.00	1.23	-	0.38	-	-	0.00	-	0.00	-	-	0.50
CCA 28	-	-	-	-	-	-	-	-	-	1.44	0.00	0.77
EXP,D&P	-	-	-	-	-	-	-	-	-	0.00	0.00	0.00
TOTAL	0.49	0.96	0.49	0.32	0.00	0.06	0.31	0.02	0.00	1.16	0.00	0.53

TABLE A-6c AVERAGE EFFECTIVE INVESTMENT TAX CREDIT RATES (%)
(All Corporations)

	A,F&F	MANUFAC	CONSTR	TR&STOR	COMM	PUB UTL	WSTRADE	RTTRADE	SERVICE	MINING	OIL&GAS	TOTAL
CCA 1	0.03	0.23	0.01	0.71	0.00	0.00	0.19	0.00	0.00	0.00	0.00	0.64
CCA 3	0.34	0.97	0.02	0.03	0.00	0.01	0.27	0.05	0.00	0.71	0.00	0.45
CCA 6	0.46	0.57	0.01	0.38	0.00	0.02	0.31	0.06	0.00	0.40	0.00	0.35
CCA 13	0.02	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
CCA 31	0.00	0.00	0.00	0.00	-	-	0.00	0.00	0.00	-	0.00	0.00
CCA 32	0.00	0.00	0.00	-	-	-	0.00	0.00	0.00	-	0.00	0.00
CCA 2	0.04	0.16	0.00	0.00	-	0.00	0.02	0.13	0.00	0.34	0.00	0.01
CCA 26	-	0.04	0.00	-	-	-	-	-	-	0.00	0.00	0.03
CCA 4	0.00	0.03	-	0.00	-	0.00	0.00	-	-	-	0.00	0.01
CCA 7	0.72	1.04	0.00	0.44	0.00	0.00	0.13	0.33	0.00	0.75	0.00	0.58
CCA 8	0.69	0.15	0.07	0.08	0.01	0.00	0.15	0.01	0.00	0.32	0.00	0.08
CCA 9	0.50	0.48	0.05	0.49	0.01	0.00	0.12	0.00	0.00	0.32	0.00	0.40
CCA 10	0.47	0.85	0.06	0.64	0.00	0.56	0.15	0.02	0.00	1.31	0.00	0.59
CCA 11	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	0.00
CCA 12	0.01	0.03	0.00	0.00	0.00	0.00	0.01	0.04	0.00	0.00	0.00	0.02
CCA 15	0.00	0.00	0.00	-	-	-	-	-	0.00	-	-	0.00
CCA 16	0.12	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.46	0.00	0.02
CCA 17	0.17	0.03	0.00	0.03	0.00	0.00	0.02	0.00	0.00	0.02	0.00	0.01
CCA 18	-	-	-	-	-	-	-	-	-	-	-	-
CCA 22	0.86	1.47	1.21	1.53	1.21	1.13	1.09	0.76	0.00	0.97	0.00	1.09
CCA 24	0.37	1.21	0.00	0.00	-	0.00	0.87	0.00	0.00	2.03	0.00	1.10
CCA 25	-	-	-	-	-	-	-	-	-	-	-	-
CCA 27	1.06	1.35	0.10	0.28	0.00	0.00	1.35	0.00	0.00	1.52	0.00	0.90
CCA 29	0.82	1.23	0.86	1.01	1.14	1.52	0.85	0.58	0.00	1.71	0.00	1.15
CCA 30	0.00	0.00	-	-	0.00	-	-	-	0.00	-	-	0.00
CCA 34	0.79	1.41	-	0.00	0.00	0.00	1.07	0.00	0.00	-	-	1.24
CCA 35	0.00	1.23	-	0.38	-	-	0.00	-	0.00	-	-	0.50
CCA 28	-	-	-	-	-	-	-	-	-	1.44	0.00	0.77
EXP,D&P	-	-	-	-	-	-	-	-	-	0.00	0.00	0.00
TOTAL	0.49	0.95	0.43	0.29	0.00	0.06	0.30	0.04	0.00	1.16	0.00	0.49

TABLE A-6d AVERAGE EFFECTIVE INVESTMENT TAX CREDIT RATES (%)
U.S. PRE-REFORM SYSTEM
(Small Corporations)

	A,F&F	MANUFAC	CONSTR	TR&STOR	COMM	PUB UTL	WSTRADE	RTTRADE	SERVICE	MINING	OIL&GAS	TOTAL
CCA 1	0.00	0.00	10.00	10.00	0.00	-	0.00	0.00	0.00	-	-	2.23
CCA 3	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	0.00	-	-	0.03
CCA 6	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-	-	2.95
CCA 13	0.12	0.46	0.00	0.00	0.00	0.00	0.00	0.00	0.57	-	-	0.20
CCA 31	0.00	0.00	0.00	0.00	-	-	0.00	0.00	0.00	-	-	0.00
CCA 32	0.00	-	0.00	-	-	-	-	0.00	0.00	-	-	0.00
CCA 2	10.00	10.00	10.00	10.00	-	10.00	-	10.00	10.00	-	-	10.00
CCA 26	-	-	-	-	-	-	-	-	-	-	-	-
CCA 4	10.00	-	-	10.00	-	-	10.00	-	-	-	-	10.00
CCA 7	7.75	7.75	7.75	7.75	7.75	-	7.75	7.75	7.75	-	-	7.75
CCA 8	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75	-	-	7.75
CCA 9	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75	-	-	7.75
CCA 10	6.20	6.20	6.82	7.44	6.20	6.20	6.20	6.20	6.20	-	-	6.38
CCA 11	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	0.00
CCA 12	10.00	6.00	10.00	10.00	10.00	6.00	10.00	10.00	10.00	-	-	7.36
CCA 15	0.00	0.00	0.00	-	-	-	-	-	-	-	-	0.00
CCA 16	6.00	6.00	6.00	6.00	-	-	-	6.00	6.00	-	-	6.00
CCA 17	0.00	0.00	0.00	0.00	6.00	0.00	0.00	0.00	0.00	-	-	0.44
CCA 18	-	-	-	-	-	-	-	-	-	-	-	-
CCA 22	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	-	-	10.00
CCA 24	7.75	7.75	-	-	-	-	7.75	-	7.75	-	-	7.75
CCA 25	-	-	-	-	-	-	-	-	-	-	-	-
CCA 27	7.75	7.75	7.75	-	-	-	-	7.75	7.75	-	-	7.75
CCA 29	7.75	7.44	7.75	7.75	7.75	7.75	7.75	7.75	7.75	-	-	7.48
CCA 30	10.00	10.00	-	-	-	-	-	-	10.00	-	-	10.00
CCA 34	7.75	7.75	-	-	-	-	-	-	-	-	-	7.75
CCA 35	-	-	-	-	-	-	10.00	-	10.00	-	-	10.00
CCA 28	-	-	-	-	-	-	-	-	-	-	-	-
EXP,D&P	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	6.91	3.96	6.07	2.18	4.36	4.78	1.84	1.78	3.46	-	-	3.57

TABLE A-6e AVERAGE EFFECTIVE INVESTMENT TAX CREDIT RATES (%)
U.S. PRE-REFORM SYSTEM
(Large Corporations)

	A,F&F	MANUFAC	CONSTR	TR&STOR	COMM	PUB UTL	WSTRADE	RTTRADE	SERVICE	MINING	OIL&GAS	TOTAL
CCA 1	0.00	0.00	10.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.09
CCA 3	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.67
CCA 6	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.50	10.00	0.51
CCA 13	0.75	0.08	0.00	0.00	0.00	0.00	0.02	0.00	0.00	6.00	6.00	0.21
CCA 31	0.00	-	0.00	0.00	-	-	0.00	0.00	0.00	-	0.00	0.00
CCA 32	0.00	0.00	0.00	-	-	-	0.00	-	0.00	-	0.00	0.00
CCA 2	10.00	10.00	10.00	10.00	-	10.00	10.00	10.00	10.00	9.20	10.00	10.00
CCA 26	-	10.00	10.00	-	-	-	-	-	-	10.00	10.00	10.00
CCA 4	-	10.00	-	10.00	-	10.00	10.00	-	-	-	10.00	10.00
CCA 7	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75	10.00	10.00	7.79
CCA 8	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75	9.20	9.60	7.88
CCA 9	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75	10.00	10.00	7.93
CCA 10	6.20	6.20	6.82	7.44	6.20	6.20	6.20	6.20	6.20	10.00	9.20	8.17
CCA 11	-	0.00	-	0.00	-	-	0.00	0.00	0.00	-	-	0.00
CCA 12	10.00	6.00	10.00	10.00	10.00	6.00	10.00	10.00	10.00	0.00	0.00	4.00
CCA 15	0.00	0.00	-	-	-	-	-	-	0.00	-	-	0.00
CCA 16	6.00	6.00	-	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
CCA 17	0.00	0.00	0.00	0.00	6.00	0.00	0.00	0.00	0.00	0.00	0.00	3.12
CCA 18	-	-	-	-	-	-	-	-	-	-	-	-
CCA 22	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	0.00	10.00	7.86
CCA 24	7.75	7.75	7.75	7.75	-	7.75	7.75	7.75	7.75	10.00	10.00	8.14
CCA 25	-	-	-	-	-	-	-	-	-	-	-	-
CCA 27	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75	10.00	10.00	7.85
CCA 29	7.75	7.44	7.75	7.75	7.75	7.75	7.75	7.75	7.75	9.60	9.50	7.61
CCA 30	-	-	-	-	10.00	-	-	-	-	-	-	10.00
CCA 34	-	7.75	-	7.75	7.75	7.75	7.75	7.75	7.75	-	-	7.75
CCA 35	10.00	10.00	-	10.00	-	-	10.00	-	10.00	-	-	10.00
CCA 28	-	-	-	-	-	-	-	-	-	8.60	9.90	9.20
EXP,D&P	-	-	-	-	-	-	-	-	-	0.00	0.00	0.00
TOTAL	6.38	4.32	6.24	6.17	4.65	9.34	2.07	1.89	3.47	5.77	6.58	5.16

TABLE A-6f AVERAGE EFFECTIVE INVESTMENT TAX CREDIT RATES (%)
U.S. PRE-REFORM SYSTEM
(All Corporations)

	A,F&F	MANUFAC	CONSTR	TR&STOR	COMM	PUB UTL	WSTRADE	RTTRADE	SERVICE	MINING	OIL&GAS	TOTAL
CCA 1	0.00	0.00	10.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.81
CCA 3	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.52
CCA 6	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.50	10.00	1.52
CCA 13	0.25	0.18	0.00	0.00	0.00	0.00	0.01	0.00	0.30	6.00	6.00	0.21
CCA 31	0.00	0.00	0.00	0.00	-	-	0.00	0.00	0.00	-	0.00	0.00
CCA 32	0.00	0.00	0.00	-	-	-	0.00	0.00	0.00	-	0.00	0.00
CCA 2	10.00	10.00	10.00	10.00	-	10.00	10.00	10.00	10.00	9.20	10.00	10.00
CCA 26	-	10.00	10.00	-	-	-	-	-	-	10.00	10.00	10.00
CCA 4	10.00	10.00	-	10.00	-	10.00	10.00	-	-	-	10.00	10.00
CCA 7	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75	10.00	10.00	7.78
CCA 8	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75	9.20	9.60	7.85
CCA 9	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75	10.00	10.00	7.91
CCA 10	6.20	6.20	6.82	7.44	6.20	6.20	6.20	6.20	6.20	10.00	9.20	7.78
CCA 11	0.00	0.00	0.00	0.00	0.00	-	0.00	0.00	0.00	-	-	0.00
CCA 12	10.00	6.00	10.00	10.00	10.00	6.00	10.00	10.00	10.00	0.00	0.00	4.33
CCA 15	0.00	0.00	0.00	-	-	-	-	-	0.00	-	-	0.00
CCA 16	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
CCA 17	0.00	0.00	0.00	0.00	6.00	0.00	0.00	0.00	0.00	0.00	0.00	3.01
CCA 18	-	-	-	-	-	-	-	-	-	-	-	-
CCA 22	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	0.00	10.00	8.80
CCA 24	7.75	7.75	7.75	7.75	-	7.75	7.75	7.75	7.75	10.00	10.00	8.14
CCA 25	-	-	-	-	-	-	-	-	-	-	-	-
CCA 27	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75	10.00	10.00	7.84
CCA 29	7.75	7.44	7.75	7.75	7.75	7.75	7.75	7.75	7.75	9.60	9.50	7.60
CCA 30	10.00	10.00	-	-	10.00	-	-	-	10.00	-	-	10.00
CCA 34	7.75	7.75	-	7.75	7.75	7.75	7.75	7.75	7.75	-	-	7.75
CCA 35	10.00	10.00	-	10.00	-	-	10.00	-	10.00	-	-	10.00
CCA 28	-	-	-	-	-	-	-	-	-	8.60	9.90	9.20
EXP,D&P	-	-	-	-	-	-	-	-	-	0.00	0.00	0.00
TOTAL	6.84	4.28	6.13	5.62	4.65	9.28	1.98	1.83	3.46	5.77	6.58	4.86

TABLE A-7a ECONOMIC DEPRECIATION RATES (%)
(Small Corporations)

	A,F&F	MANUFAC	CONSTR	TR&STOR	COMM	PUB UTL	WSTRADE	RTTRADE	SERVICE	MINING	OIL&GAS	TOTAL
CCA 1	3.98	3.85	5.43	3.40	3.96	-	3.44	3.44	3.45	-	-	3.51
CCA 3	4.40	3.76	3.53	3.17	3.74	2.91	3.22	3.22	3.24	-	-	3.39
CCA 6	3.71	4.22	5.43	3.75	3.96	3.48	3.79	3.79	3.45	-	-	3.82
CCA 13	5.29	5.05	7.96	3.89	5.01	3.35	3.97	3.97	4.00	-	-	4.17
CCA 31	3.74	3.23	3.53	3.53	-	-	3.22	3.22	3.24	-	-	3.37
CCA 32	3.78	-	3.53	-	-	-	-	3.22	3.24	-	-	3.56
CCA 2	3.00	3.16	3.16	3.00	-	3.16	-	3.00	3.00	-	-	3.06
CCA 26	-	-	-	-	-	-	-	-	-	-	-	-
CCA 4	6.60	-	-	6.60	-	-	6.60	-	-	-	-	6.60
CCA 7	7.50	7.50	7.50	7.50	7.50	-	7.50	7.50	7.50	-	-	7.50
CCA 8	11.53	15.59	15.61	13.61	15.46	15.75	16.12	16.12	15.10	-	-	14.84
CCA 9	18.33	18.33	18.33	18.33	18.33	18.33	18.33	18.33	18.33	-	-	18.33
CCA 10	15.73	27.27	21.46	25.56	29.13	27.54	27.54	27.54	27.44	-	-	24.86
CCA 11	11.15	11.15	11.15	11.15	11.15	-	11.15	11.15	11.15	-	-	11.15
CCA 12	35.29	29.72	31.34	8.77	46.76	6.04	31.76	35.29	44.22	-	-	33.54
CCA 15	20.00	20.00	20.00	-	-	-	-	-	-	-	-	20.00
CCA 16	33.33	33.33	33.33	33.33	-	-	-	33.33	33.33	-	-	33.33
CCA 17	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	-	-	2.90
CCA 18	-	-	-	-	-	-	-	-	-	-	-	-
CCA 22	16.33	17.22	16.33	17.22	16.86	17.22	17.22	16.86	17.22	-	-	16.67
CCA 24	12.25	12.25	-	-	-	-	12.25	-	12.25	-	-	12.25
CCA 25	-	-	-	-	-	-	-	-	-	-	-	-
CCA 27	11.79	11.79	11.79	-	-	-	-	11.79	11.79	-	-	11.79
CCA 29	12.25	10.30	12.25	12.25	12.25	12.25	12.25	12.25	12.25	-	-	10.56
CCA 30	22.70	22.70	-	-	-	-	-	-	22.70	-	-	22.70
CCA 34	11.79	11.79	-	-	-	-	-	-	-	-	-	11.79
CCA 35	-	-	-	-	-	-	6.60	-	6.60	-	-	6.60
CCA 28	-	-	-	-	-	-	-	-	-	-	-	-
EXP,D&P	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL	8.83	9.97	14.99	8.03	9.31	6.80	8.37	8.59	12.95	-	-	10.39

TABLE A-7b ECONOMIC DEPRECIATION RATES (%)
(Large Corporations)

	A,F&F	MANUFAC	CONSTR	TR&STOR	COMM	PUB UTL	WSTRADE	RTTRADE	SERVICE	MINING	OIL&GAS	TOTAL
CCA 1	4.72	3.73	5.43	3.40	3.96	3.13	3.44	3.44	3.45	3.40	3.40	3.42
CCA 3	4.50	3.66	3.53	3.11	3.74	2.91	3.22	3.22	3.24	3.63	3.63	3.55
CCA 6	3.80	4.06	5.43	3.73	3.96	3.48	3.79	3.79	3.45	7.99	8.00	3.99
CCA 13	6.16	4.76	7.96	3.88	5.01	3.35	3.97	3.97	4.00	4.60	4.60	4.24
CCA 31	4.68	-	3.53	3.53	-	-	3.22	3.22	3.23	-	3.22	3.49
CCA 32	4.68	3.23	3.53	-	-	-	3.22	-	3.24	-	3.22	3.27
CCA 2	3.00	3.16	3.16	3.00	-	3.16	3.00	3.00	3.00	7.99	8.00	3.13
CCA 26	-	2.90	2.90	-	-	-	-	-	-	2.90	2.90	2.90
CCA 4	-	6.60	-	6.60	-	6.60	6.60	-	-	-	6.60	6.60
CCA 7	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	9.99	10.00	7.54
CCA 8	11.53	15.59	15.61	13.61	15.46	15.75	16.12	16.12	15.10	13.32	13.33	15.21
CCA 9	18.33	18.33	18.33	18.33	18.33	18.33	18.33	18.33	18.33	18.31	18.33	18.33
CCA 10	15.73	27.27	21.46	25.56	29.13	27.54	27.54	27.54	27.44	9.99	10.00	17.65
CCA 11	-	11.15	-	11.15	-	-	11.15	11.15	11.15	-	-	11.15
CCA 12	35.29	41.46	31.34	8.77	46.76	6.04	31.76	35.29	44.22	9.99	10.00	29.29
CCA 15	20.00	20.00	-	-	-	-	-	-	20.00	-	-	20.00
CCA 16	33.33	33.33	-	33.33	33.33	33.33	33.33	33.33	33.33	33.30	33.33	33.33
CCA 17	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90
CCA 18	-	-	-	-	-	-	-	-	-	-	-	-
CCA 22	16.33	17.22	16.33	17.22	16.86	17.22	17.22	16.86	17.22	12.14	12.15	15.83
CCA 24	12.25	12.25	12.25	12.25	-	12.25	12.25	12.25	12.25	12.24	12.25	12.25
CCA 25	-	-	-	-	-	-	-	-	-	-	-	-
CCA 27	11.79	11.79	11.79	11.79	11.79	11.79	11.79	11.79	11.79	11.78	11.79	11.79
CCA 29	12.25	10.68	12.25	12.25	12.25	12.25	12.25	12.25	12.25	10.64	10.65	10.72
CCA 30	-	-	-	-	22.70	-	-	-	-	-	-	22.70
CCA 34	-	11.79	-	11.79	11.79	11.79	11.79	11.79	11.79	-	-	11.79
CCA 35	6.60	6.60	-	6.60	-	-	6.60	-	6.60	-	-	6.60
CCA 28	-	-	-	-	-	-	-	-	-	9.99	10.00	9.99
EXP,D&P	-	-	-	-	-	-	-	-	-	9.99	10.00	10.00
TOTAL	10.42	10.55	14.04	6.08	8.19	6.20	7.44	7.95	13.26	10.02	9.97	9.28

TABLE A-7c ECONOMIC DEPRECIATION RATES (%)
(All Corporations)

	A,F&F	MANUFAC	CONSTR	TR&STOR	COMM	PUB UTL	WSTRADE	RTTRADE	SERVICE	MINING	OIL&GAS	TOTAL
CCA 1	4.19	3.74	5.43	3.40	3.96	3.13	3.44	3.44	3.45	3.40	3.40	3.43
CCA 3	4.41	3.67	3.53	3.13	3.74	2.91	3.22	3.22	3.24	3.63	3.63	3.52
CCA 6	3.72	4.09	5.43	3.73	3.96	3.48	3.79	3.79	3.45	7.99	8.00	3.92
CCA 13	5.47	4.84	7.96	3.88	5.01	3.35	3.97	3.97	4.00	4.60	4.60	4.21
CCA 31	4.09	3.23	3.53	3.53	-	-	3.22	3.22	3.23	-	3.22	3.42
CCA 32	3.78	3.23	3.53	-	-	-	3.22	3.22	3.24	-	3.22	3.42
CCA 2	3.00	3.16	3.16	3.00	-	3.16	3.00	3.00	3.00	7.99	8.00	3.13
CCA 26	-	2.90	2.90	-	-	-	-	-	-	2.90	2.90	2.90
CCA 4	6.60	6.60	-	6.60	-	6.60	6.60	-	-	-	6.60	6.60
CCA 7	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	9.99	10.00	7.53
CCA 8	11.53	15.59	15.61	13.61	15.46	15.75	16.12	16.12	15.10	13.32	13.33	15.12
CCA 9	18.33	18.33	18.33	18.33	18.33	18.33	18.33	18.33	18.33	18.31	18.33	18.33
CCA 10	15.73	27.27	21.46	25.56	29.13	27.54	27.54	27.54	27.44	9.99	10.00	19.21
CCA 11	11.15	11.15	11.15	11.15	11.15	-	11.15	11.15	11.15	-	-	11.15
CCA 12	35.29	40.09	31.34	8.77	46.76	6.04	31.76	35.29	44.22	9.99	10.00	29.71
CCA 15	20.00	20.00	20.00	-	-	-	-	-	20.00	-	-	20.00
CCA 16	33.33	33.33	33.33	33.33	33.33	33.33	33.33	33.33	33.33	33.30	33.33	33.33
CCA 17	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90	2.90
CCA 18	-	-	-	-	-	-	-	-	-	-	-	-
CCA 22	16.33	17.22	16.33	17.22	16.86	17.22	17.22	16.86	17.22	12.14	12.15	16.20
CCA 24	12.25	12.25	12.25	12.25	-	12.25	12.25	12.25	12.25	12.24	12.25	12.25
CCA 25	-	-	-	-	-	-	-	-	-	-	-	-
CCA 27	11.79	11.79	11.79	11.79	11.79	11.79	11.79	11.79	11.79	11.78	11.79	11.79
CCA 29	12.25	10.65	12.25	12.25	12.25	12.25	12.25	12.25	12.25	10.64	10.65	10.70
CCA 30	22.70	22.70	-	-	22.70	-	-	-	22.70	-	-	22.70
CCA 34	11.79	11.79	-	11.79	11.79	11.79	11.79	11.79	11.79	-	-	11.79
CCA 35	6.60	6.60	-	6.60	-	-	6.60	-	6.60	-	-	6.60
CCA 28	-	-	-	-	-	-	-	-	-	9.99	10.00	9.99
EXP,D&P	-	-	-	-	-	-	-	-	-	9.99	10.00	10.00
TOTAL	9.05	10.49	14.64	6.34	8.21	6.21	7.81	8.30	13.07	10.02	9.97	9.48

Notes

1. Strictly speaking, in order for the tax system to be non-distortionary or neutral, both relative prices and the allocation of goods and services would have to be unaffected by taxes. No tax system, however, is ever likely to satisfy these requirements. Another, less stringent definition of a neutral tax system is one that applies equal marginal tax rates to all investments.

2. An alternative to the use of expected income and taxes is to measure the tax rate based on the risk-adjusted value of taxes and income. Because we assume all industries (except for resource firms) face the same risk, it does not matter too much which measure is used.

3. Marginal tax rates were also calculated by the Department of Finance (1985a) for a recent discussion paper. Because of important changes to the data and the methodology, however, the marginal tax rates presented in that paper are not comparable with the ones presented here.

4. If capital is immobile internationally, then domestic investment is necessarily financed by domestic savings. As a result, the incentive to save and to invest is influenced by corporate plus personal taxes.

5. The Pre-Reform tax system is described in more detail in Section V. Briefly, it is a tax system that represents a fully phased-in corporate income tax system including the proposals announced in the 1986 federal budget. This definition of the Pre-Reform tax system is consistent with the one used in the White Paper.

6. In the Pre-Reform case, the marginal tax rates on land and inventories for small businesses differ across industries because the small manufacturing deduction was not earned exclusively by the manufacturing sector. This variation is completely removed in the Reform case except for manufacturing and agriculture. The reason for this result is the elimination of the small manufacturing and processing deduction at the federal level. All small businesses now face the same statutory federal rate. As a result, the marginal tax rates on these two assets are identical in most cases. Because some provinces have a preferential rate for small manufacturing, the marginal tax rate on these two assets will be different for manufacturing.

7. It is important to note that the results for the United States are not the actual marginal effective tax rates that existed before and after tax reform in that country since the calculations are based in part on Canadian weights and economic parameters. Although our results show U.S. marginal tax rates decreasing after tax reform, there is some evidence that they actually increased. See, for example, Fullerton (1987).

8. The results for the United States exclude any effects of the new Alternative Minimum Tax (AMT). The AMT has a different statutory tax

rate and separate depreciation schedules, allowable deductions, and tax exclusions compared with the regular corporate income tax. In some instances, the AMT may impose a significant tax liability on certain corporations. The marginal tax rates would be different than the ones reported here if the AMT were incorporated into the simulations. Among other things, the AMT could reduce the benefits to the taxpayer of accelerated depreciation allowances. The precise impact of the AMT on the incentive to invest depends on how long the firm is subject to AMT liability, when the investment was made, and the source of financing for the investment. Depending on the circumstances, the AMT may increase or decrease the incentive to invest. See Lyon (1989) for additional details.

9. Note that even if Canada is a net exporter of capital, the world interest rate would be unaffected by any tax on savings (unless the terms of trade were affected) owing to the assumption of smallness. If savings are taxed, Canadians would reduce their holdings of international assets and the investment decision would be unaffected.

10. The formula for declining balance depreciation allowances is calculated on the basis of continuous time. On the other hand, the formula for straight line depreciation allowances uses discrete time but discounting begins with the first rather than the second write-off. This is equivalent to dividing the usual discrete time formula through by $(1 + r)$. In making this adjustment, we approximate the present value under continuous time using the discrete time formula. To see this, note that the present value calculated under discrete time is greater than the present value under continuous time by a factor of $(1 + r)$, where r is the discount rate. Therefore, dividing the discrete time formula by $(1 + r)$ will approximate the continuous time present value. This adjustment ensures that both present value calculations are made on the same basis, that is, under continuous time.

11. To simplify the equations which follow, note that the expression for u_c assumes that the resource allowance is available for provincial corporate income tax purposes. This is not the case in Ontario, however. Because our calculations for the mining sector were made by province and then aggregated, our results do reflect the correct provincial treatment of the resource allowance.

12. In some provinces there is also an investment tax credit in mining which, for the purposes of the mining tax, reduces Z_m. In B.C., Z_m is reduced by the ITC for income tax purposes.

13. Class 28 is made up of assets used in a new mine or major mine expansion.

14. To see this, note that equation (20) can be written as follows:

$$c/q = \frac{(r - \pi + \delta)(1 - \phi)(1 - u_c Z)\left[1 - u_m Z_m (1 - u_c)/(1 - \phi)(1 - u_c Z)\right]}{(1 - u_c)(1 - u_m)}$$

$$\frac{(r - \pi + \delta)(1 - \phi)(1 - u_c Z)}{(1 - u_c)} \quad \frac{\left[1 - u_m Z_m (1 - u_c)/(1 - \phi)(1 - u_c Z)\right]}{(1 - u_m)}$$

15. A further discussion on the effects of inflation on marginal effective tax rates may be found in Department of Finance (1985b). Briefly, a lower inflation rate will increase the value of CCA write-offs which are based upon historical costs. Moreover, a lower inflation rate will reduce the tax on the inflationary component of inventories which are valued using FIFO in Canada. These two effects tend to reduce marginal effective tax rates. On the other hand, a lower inflation rate will reduce nominal interest rates and interest payments on corporate debt. These deductible payments will be lower which will result in higher corporate taxes. The impact of a lower inflation rate on marginal tax rates is therefore ambiguous.

    Marginal tax rates were calculated using a 4 per cent inflation rate in Canada and the U.S. to see how sensitive the results were. For example, in manufacturing the marginal tax rates before and after reform are lower in Canada by one-half of a percentage point whereas for the U.S. there is little change. The overall marginal tax rates in both countries are similar to the ones reported in Table 6. Our calculations do not appear to be highly sensitive to a lower inflation rate.

16. See Daly and Jung (1987) for a discussion of the effects of alternative arbitrage assumptions on marginal effective tax rates.

17. See, for example, Jog and Mintz (1987) for a further discussion of "income risk" and "capital risk" in the calculation of marginal effective tax rates.

18. Alberta's program for royalty deductibility is known as the Royalty Tax Deduction. In some cases for Alberta, it was assumed that the resource allowance would be claimed instead because of the low royalty. That is, the firm elected not to take the Royalty Tax Deduction. Both Saskatchewan and B.C. have similar rebates but they are not elective unlike the Alberta system.

19. Note that these assets are now in Classes 40 and 41. Also, tax reform did not reduce the accelerated portion of these write-offs. That is, the

additional allowance of expenditures up to the income from a new mine of major mine expansion was retained under Tax Reform. Our calculations do not incorporate this additional allowance.

20. Three year property includes certain small tools, specialized manufacturing devices, tractors, certain horses, autos and light trucks, and research and experimentation equipment.

21. Strictly speaking, 2,170 is the upper bound of the number of investment projects. The actual figure is lower because some industries do not have all 31 different types of capital.

22. In the resource sector, a portion of engineering construction was allocated to the machinery category.

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